SCIENTIFIC AMERICAN

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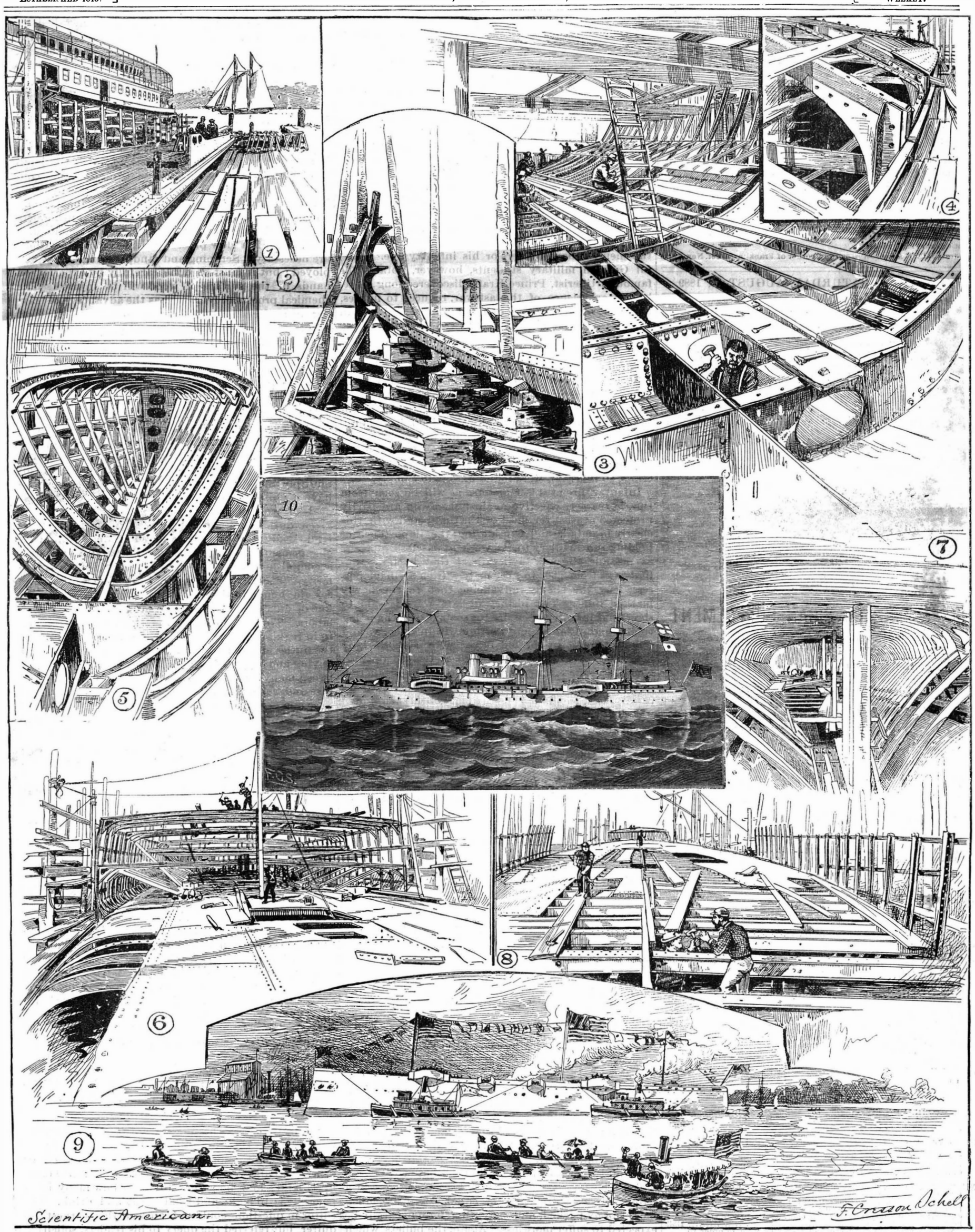

1. The keel: April 20, 1888. 2. The stem: about May 2, 1888. 3. View looking forward: June 4, 1888. 4. View looking forward; side of protective deck: July 3, 1888. 5. View looking up in bow: August 24, 1888. 6. On protective deck, looking forward: Sept. 26, 1888. 7. From stern post, looking forward under protective deck: Nov. 7, 1888. 8. On gun deck (under poop), looking forward: Dec. 7, 1888. 9. Launched. 10. As she will appear when ready for action.

THE BUILDING OF A CRUISER—CONSTRUCTION OF THE NEW CRUISER PHILADELPHIA, AT CRAMP'S SHIP YARD.—[See page 85.]

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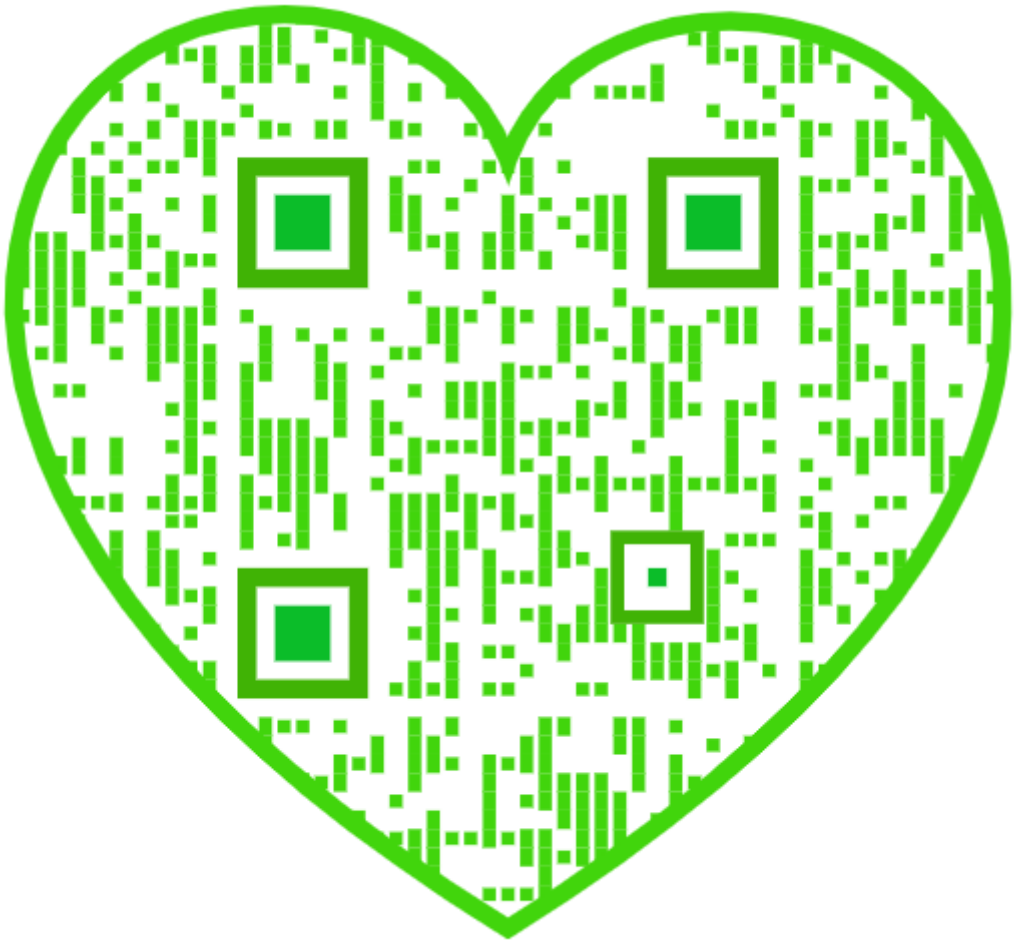

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NEW YORK, SATURDAY, AUGUST 10, 1889.

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DR. BROWN-SEQUARD'S RECENT EXPERIMENTS.

In this week's SUPPLEMENT we give in full Dr. Brown-Sequard's paper, lately communicated to the Societe de Biologie, of Paris, in which he details the remarkable effects produced in his own person and also in several other men of advanced years, by the subcutaneous injection of substances derived from the testicular portions of the bodies of certain animals. Whatever may prove to be the ultimate value of the doctor's discovery, his present paper will be read with much interest, and the results of further practice with the new treatment will be eagerly looked for by the public. The number of elderly people who are anxious to be made young and happy again is almost countless, and there is likely to be an epidemic desire among them to try the new medicine. A golden harvest seems to be in view for the doctors.

THE NEW GERMAN ARTILLERY TACTICS.

The changes that have for some time been making in the German artillery service seem not to have attracted the attention they deserve till now, when, against all precedents, however, which would seem to have little reasonableness to sustain them, the tactics have been changed so as to make artillery self-reliant up to 1,000 meters of the enemy; their practice to include that range. Heretofore the light batteries, for it is to that this refers, have been relieved by infantry whenever practicable at 1,000 and even 1,100 meters, the theory being that the gun crews were unprotected at such ranges; could, in fact, be readily picked off by the enemy's sharpshooters or his infantry line. Careful German military students, however, notably the famous artillerist, Prince Kraft, discovered long since, by the experience of the last war, reduced to figures, that men serving light guns get more protection than those of any other arm, and that, even when necessarily exposed beyond the long established limit, suffered no such casualties as would seem to have been taken for granted.

St. Privat was only one of many instances where artillery held their own against infantry at 1,000 meters, and, at some points, something less than this. For nearly 2½ hours a battery of 86 guns held its own under what, at times, was an enfilading fire, and when at last, dusk coming, and with it the order for the artillery to advance with the infantry line, only three gun crews, so it is said, were found unable to comply.

Infantry fire at 1,000 meters, as will be seen from this, is scarcely effective against men who are partly protected at least for most of the time; and with this clearly in mind, and considering the importance of holding the artillery to its work at as close quarters as possible, the new tactics direct that batteries unlimber at from 2,000 to 1,600 meters from a village possessed by the enemy, advancing then to the newly marked limit. The history of late wars is said to show that infantry open fire too soon, often exhausting their ammunition before getting within effective and telling range. In the old days, with smooth bore "muskets," such a range as 1,000 meters to open at would, of course, have been absurd. The injunction of a famous revolutionary general of our own comes readily to the mind at the thought of such folly: "Wait till you see the whites of their eyes!" he called to his men awaiting the enemy's advance; thus encouraging them to save their fire till the effective moment. The late General Sheridan in his "From Gravelotte to Sedan" refers particularly to the waste of ammunition, the men (Germans) advancing, not as in our formation of the line of battle, shoulder to shoulder, a second line behind the first, but as in a deployed skirmish line, firing as they went; the execution being imperceptible, if there was any at all at the long range.

If now there was a great waste of ammunition with the single firer, which must be reloaded after each discharge, how much greater it is likely to be with the magazine gun, now in general use in European armies and good for at least five shots without renewal? The new light artillery arm, too, being a quick firer, though of much longer range and with heavier shot than the old type, is said to be well calculated to do effectively what, at the same range, infantry have heretofore, as the authorities quoted allege, only made a pretense of doing, to the useless waste of magazine stores.

In the new German tactics the light artillery will do the work formerly attempted by infantry at what is long range with the rifle, to wit, 1,100 meters, and even at much less than this, the infantry line reserving its fire till within effective range.

"The war of 1870–71," says a writer on the subject, "completely dispelled the old prejudice against allowing artillery to enter the limits of rifle fire, for why should a gunner be exposed to less danger than an infantryman? Moreover, the former does not, under similar conditions, run the same risk as the latter. If you count the men who stand in the front of 120 paces, which a battery occupies, you will see that those in a strong line of skirmishers of equal extent are much more closely packed, and may, therefore, naturally be expected to suffer more loss. Again, the bullets which at a field firing in peace time strike guns, limbers, horses, etc., count among hits, while on service they make but little impression upon the men and do them no harm. Artillery may, therefore, when needful, expose itself to infantry fire."

Removing Paint.

The ordinary process of scraping old paint, or burning it off, is hardly expeditious enough for general purposes, and is also laborious. Soda and quicklime are far more thorough, and the paint is more quickly removed. The solution of half soda and half quicklime is thus made. The soda is dissolved in water, the lime is then added, and the solution can be applied with a brush to the old paint. A few minutes is sufficient to remove the coats of paint, which may be washed off with hot water. Many preparations are sold for the removal of paint, all of them having some basis of alkali. A paste of potash and strong lime is far more effectual in operation, and the oldest paint can be removed by it. Afterward a coating of vinegar or acid should be used to cleanse the surface before repainting. One authority on the subject recommends the gasoline lamp, a quart of oil being sufficient to last 3½ hours. The method is considered superior to gas, as the flame is stronger and the cost less, besides which the lamp can be carried to any part, which cannot be done conveniently with a gas jet. But the use of flame of either is dangerous and to be avoided when possible. Many a house has been burnt to the ground from using jets of flame. For removing varnish, spirits of ammonia is used, but it is a slow process, and several applications are necessary. Scraping and sandpapering can be employed; but it must be done carefully by experienced hands, or the surface of wood will be injured. The chemical process of removal has the advantage of leaving the surface in a better condition than burning off or scraping, and for large surfaces of paintwork is to be preferred.

Regularity of Habit.

One of the most difficult of all minor habits to acquire, says an able writer, is that of regularity. It ranks with that of order. The natural inclination of most persons is to defer until the last possible moment, or to put it off to another time, where this can possibly be done. Yet habits of regularity contribute largely to the ease and comfort of life. A person can multiply his efficiency by it. We know persons who have a multitude of duties, and who perform a vast deal of work daily, who set apart certain hours for given duties, and are there at the moment and attend rigidly to what is in hand. This done, and other engagements are met, each in order, and a vast deal accomplished, not by strained exertion, but by regularity. The mind can be so trained to this that at certain hours in the day it will turn to a particular line of duty, and at other hours to other and different labors. The very diversity is restful, when attended to in regular order. But let these run together, and the duties mixed, and what before was easy is now annoying and oppressive, and the exact difference between many is at this point. There are those who confuse and rush, and attempt to do several things at once and accomplish little, while another will quietly proceed from one duty to another, and easily accomplish a vast amount of work. The difference is not in the capacity of the two, but in the regular methods of the one, as compared with the irregular and confused habits of the other.

A Cheap Elevator.

A Berlin inventor has devised a simple and inexpensive elevator for private dwellings, in place of the ordinary staircase, which may suggest to some inventor a better means of accomplishing the same object. The Berlin invention is on the principle of the inclined railway, and the motive power is furnished by the city water, which is applied in the cellar; each flight has its separate chair, so that, for example, one person can ascend from the first to the second story while another is on his way from the second to the third, or still another is descending from the fifth to the fourth. The chair, being only of the width of the human body, leaves a free passage for any who wish to walk up or down instead of riding. It is set in motion by a simple pressure of one of its arms, and after it has been used it slides back to the bottom step, its descent being regulated in such a manner that the passenger is carried with entire safety. The motive power is, of course, more or less expensive, according to the cost of water, this being, it is stated, at Berlin, at the rate of a little more than one-tenth of a cent only for each trip.

AMERICAN editors are not the only ones who run the risk of having their brains addled by nonsensical questions. Some brilliant Englishman writes to the editor of a local paper to say that he wants to ride 100 miles in 11 hours, and he wishes to know how many stoppages he is to make and what to eat and drink. The editor in question could not answer this earnest inquirer, but referred the query to his readers, soliciting their assistance.

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The San Blas Route for a Canal.

In a paper read before the Minneapolis Society of Civil Engineers by Mr. W. M. Redfield, he says:

I will now give a little information derived from an article in *Van Nostrand's Magazine* of June, 1869. A survey of the route was made in 1863, and a report thereof in 1864, on behalf of Mr. Fred. M. Kelly and others, of New York City, under the direction of A. McDougall, of Massachusetts, now deceased, as chief engineer, and Charles A. Sweet, of Syracuse, N. Y., as principal assistant. According to this survey the length of route from coast to coast is 30·03 miles. It extends from Chepillo Island on the Pacific coast (about 30 miles east of Panama), to the Gulf of San Blas on the Atlantic side. For convenience, the work may be divided into four sections.

The first section extends from Chepillo Island to "Paneas" on the Bayano River, and is 10·101 miles long. Work required: A composite dam across the river at the Great Bend of the same; a tidal lock at the Great Bend, with walls 45½ feet high; a short canal cut across the Bend; removal of sand bars in Pacific Harbor and in Bayano River; and a lighthouse at Chepillo Island. Estimated cost, including draining, chopping, earth and river excavation, embankment, masonry, labor, materials, etc.: Removal of bars, $136,684; lighthouse, $12,000; tidal lock, $675,844; composite dam, $174,631; Great Bend cut, $209,835; total, $1,208,994.

Section 2 is a canal from Bayano River at Paneas to the south end of the tunnel, and is 8·996 miles long. The work consists of the canal proper and a new channel for the Mamoni River (crossed by route of canal), about 3·6 miles long. Estimate of cost: Canal, inclusive of bailing, draining, chopping, excavation, embankment, puddling, etc., $13,033,943; new channel for Mamoni River, $115,752; total, $13,149,695.

Section 3 is a tunnel through the Cordilleras, 7 miles long. This is exclusively rock excavation. It consists of a canal of 25 feet depth of water, a perpendicular excavation of 29 feet above water surface on either side, from which springs an arch, forming the roof, and sufficiently high to pass over and clear the tallest masts. This section at $2.50 per cubic yard is estimated to cost $29,316,067.

Section 4 extends from the north end of tunnel to 25 feet depth of water in the Gulf of San Blas, on the Atlantic side, and is 3·073 miles long. The work consists of the canal proper, a lock with 9 feet fall and walls 38½ feet high, and a lighthouse on San Blas Point. Estimate of cost is:

Canal	$11,234,318
Lock No. 2, or lift lock	506,017
Lighthouse	12,000
	$11,752,335

SUMMARY.

Section 1	$1,208,994
" 2	13,149,695
" 3	29,316,067
" 4	11,752,335
	$55,427,091
10 per cent for engineering and contingencies	5,602,809
Medical and military aid, etc., interest on capital during construction, and transportation	32,500,000
	$93,529,900

This estimate is based upon a canal (except in tunnel) having a surface width of 143 feet; at the bottom a width of 100 feet, and 25 feet depth of water. A second and cheaper estimate on a smaller size of canal is also given, which I shall not here repeat. Summed up, the general facts are: Entire route, except near the mountains, is nearly level; summit of Cordilleras varies under and over 1,200 feet above the sea; entire canal to be fed from Pacific Ocean, and water maintained at the level of ordinary high tide in the Pacific. Tides in Pacific rise from 12·65 to 22 feet for highest. On Atlantic side there is from one to one and a half feet from ebb to flow.

From an article in the *Journal of the Association of Engineering Societies* for August, 1886, there is seen to be stated that an approximate estimate of work done on the Panama Canal, and work still to do to complete the same in eight years, in total, amounts in round numbers, with interest to same, $800,000,000. Now put these figures against the above estimate for the San Blas route, and there seems to be no doubt as to which is the best route. Take alone Mr. Evans' reasons, that "it is not on a line of drainage, no Chagres problem to contend with, a good harbor at each end" (the Panama route has them not), and the other reasons given by him are sufficient to make the San Blas route the best.

And now, what about the chief objection raised against said route, to wit, a tunnel large and tall enough to float the largest ships? Is that enough reason to condemn a route when every other argument is in its favor? Has not the science of tunneling advanced to such an extent in the last ten years that the objection can be overruled? It would appear so. For instance, drive a small heading having its roof coincident with the crown of the arch of tunnel roof; sink as many shafts as practicable, so as to admit of more faces to work said heading. After headings are sufficiently advanced, keep adding forces to excavate on floors and sides of same, conforming all the time to roof and sides of large tunnel. Soon the work ceases to be tunnel work, and becomes open excavation in tunnel. The work can be performed day and night, rain or shine, when outside work would have to stop. The wonder is that this route was not chosen instead of the one at Panama, the more one looks into it. Again, the seven miles of tunnel might be shortened to five, or even three, by enduring some open cuts of 600 or 700 feet in depth near the portals of the tunnel. With everything else so much in its favor, it seems folly to shrink from what nowadays is no objection at all, that is to say, a tunnel.

In conclusion, I would also suggest that after the canal was opened and paying revenue, a portion of said revenue might very wisely be applied each year to removing the roof from the tunnel, or, in other words, converting the tunnel into an open cut, and thus giving to the world a monument of American engineering skill and a bona fide vindication and enforcement of the Monroe doctrine.

Lemon Cultivation in Sicily.

The United States consul in Messina, in a recent report, says that the well-known variety of lemon called the "lunare," or ever-bearing, produces blossoms and fruit every month in the year. When, however, during the Indian summer rainy days are succeeded by dry, clear weather, lemon trees of different varieties immediately put on bloom, and if, owing to the mildness of the season, the fruit sets in at the beginning of winter, it will come to maturity at midsummer. Lemons are divided into two classes—the true and bastard lemon. The former is produced by the April and May blooms, the bastard by the irregular blooms of February, March, June, and July, which depend upon the rainfall or regular irrigation and the intensity of the heat during the summer and winter seasons. The true lemon requires nine months to reach maturity—from the bloom in May to the mature fruit in January. There are but three harvests of the true lemon; the first in November, when the lemon is green in appearance and not fully ripe. These lemons are the most highly prized; they possess remarkable keeping qualities, and are admirably preserved in boxes in warehouses from November until March, and sometimes as late as May, and then shipped. The second harvest occurs in December and January. These lemons must be shipped three weeks after gathering, by which time they have acquired a yellowish appearance. The third harvest occurs in March and April. This fruit is shipped as soon as gathered, spring prices being very high. The uniformity in size of lemons is due to the monthly harvestings from October to March. Bastard lemons present well characterized peculiarities in shape and appearance; their inner skin is fine, and adheres tenaciously to the meat; they are hard, rich in acid, and seedless. The bastard lemon, produced from the bloom of June 1, is still green the following April, and ripens only toward the end of July. It remains on the trees over a year, and sells well in summer. Besides the March and June bastards, there are yet others that remain on the trees from 12 to 18 months. The true lemon can be left on the tree until the end of May or the first week in June; but it interferes with the new crop, drops off from over-maturity, and is liable to be attacked by insects. The bastards, on the contrary, withstand bad weather and parasites, and they mature from June to October. It is estimated that four times more oranges than lemons are lost in the groves and warehouses. Good drainage is most essential in orange and lemon culture. In Sicily lemon cultivation is 30 per cent more profitable than that of oranges, for the trees are more prolific and the prices higher.

Egyptian Wax Portraits.

When the moderns read in Pliny of the extreme degree of excellence to which Greek artists had attained in his day and of the prices which some of their works fetched, equivalent to ten or twelve thousand pounds of our money, scholars and other competent authorities dismissed these as travelers' tales. They could not bring themselves to believe that these stories were true, or that Rubens, Holbein, Sir Thomas Lawrence, and other later celebrities had been anticipated if not surpassed in the centuries before the Christian era. And yet it was so, and Pliny no more than Herodotus deserved to be called the father of liars.

The graves have given up their dead, and revealed secrets which it was thought had been forever hidden in the tomb. It is from the land of Egypt that these discoveries come. The explorations on the site of Memphis and Thebes had prepared the way for the discoveries in the province of Faijum. These consist of a number of portraits found in the sand at Rubaijat, which are in the possession of Theodor Graf in Vienna, and are now on view at the Societe d'Encouragement pour l'Industrie Nationale, 44 Rue de Rennes.

According to ancient Egyptian custom, the countenance of the deceased was represented at the head of the mummy or coffin. This custom was adhered to in the Græco-Roman epoch of Egypt, but instead of the plastic head, which up to that time had been alone in use, a painting was substituted, representing a real portrait of the deceased. These portraits, which were painted on a thin panel of wood, were laid over the face of the mummies, the outer bandages of the shrouds being then wrapped about them so as to cover the margin of the picture, the latter alone being left visible. A mummy of this kind, therefore, presented the appearance of a living body, looking out of an opening in the bandages for the survivors to gaze upon in the coffins, the lids of which were made to be thrown back for that purpose.

The only other graves where these curious pictorial works have been found were opened in the winter of 1887–88 by the English engineer Mr. Petrie, at Haward, but the pictures discovered in them are said to be not nearly equal to the specimens discovered at Rubaijat. The tombs themselves built in the rocks were ransacked ages ago by thieves, who, in their search for gold, destroyed both coffins and mummies. Luckily the pilferers deemed the pictures to be of no value, and so they were thrown away—but not to perish—in the dry dust of the desert.

Herr Graf's collection numbers 95 specimens of varying interest in point of execution, but all valuable as works of art. They are portraits on cypress wood, the more ancient being painted in wax colors, laid on with the cestrum or spatula, a lancet-shaped instrument—the later specimens being produced by water colors, to which was added the yolk and white of eggs, or other resinous binding substance. The painting with wax was done without the employment of heat, and without using the brush, the ancients being ignorant of the process of dissolving wax in turpentine.

On examining these rows of heads gazing calmly out of large lustrous eyes, shut now for over 2,000 years, one seems to be brought face to face with the past of humanity in a more real way than has hitherto been in our power. One is also struck with the modern look of many of these ancient portraits. There is a face of an old man of wonderful force of character and intellectual power. The painter Menzel, of Berlin, has declared that nothing finer than this has been done in portrait painting. The female faces are nearly all tinged with melancholy, but some are of great beauty, and they almost without exception reveal traces of the distinction of the originals. There is a very modern head of an old lady with short gray locks. The fidelity of execution in these paintings is so great that doctors have been able to detect the existence of dropsy. The French government is in treaty for the collection, the value of which is estimated at about £40,000.—*The Architect.*

A Sarcastic Thunderbolt.

In a thunder storm recently the Jefferson Physical Laboratory of Harvard University was struck by lightning. A number of students were in the building at the time, but fortunately nobody was hurt. The electric current passed down the chimney and through an iron door into the ground with a tremendous explosive report.

It seems strange that the home of physical science at the greatest institution of learning in the country should be so inadequately protected against lightning as to be struck by a thunderbolt.

There is a popular impression, it may be that it is erroneous, that the intelligent application of metallic conductors to the exterior of a building will prevent destruction or injury by lightning to the edifice or its inmates. It is also commonly supposed that the persons who understand best how to protect buildings against lightning are men constantly engaged in the study and teaching of physical science; just such persons as the professors and instructors in physics at Harvard College. How comes it, then, that these gentlemen have not made their own workshop safe? Is it because science is powerless, or because they have had no thought of danger from this source until now?

The unprecedented destructiveness of lightning this season gives exceptional interest to these inquiries. A man was killed by lightning at Fitchburg, in eastern Massachusetts, in the very storm in which the Physical Laboratory at Cambridge was struck; and only a few days earlier there was a fatal lightning accident at East Brookfield. The possibility of protection against danger from lightning is thus seen to be a question of contemporaneous human interest quite as important as the question whether a criminal can be put to death painlessly by passing an electric current through his body.

We wish the men of science who are competent to speak on the subject would tell us less about making electricity kill people and more about preventing it from killing them.—*N. Y. Sun.*

THE United States Potters' Association, Baltimore, Md., is endeavoring to interest art schools to make special efforts in the direction of training artists to teach the practical points so necessary for students to become familiar with, in order to make good designs n different branches of business.

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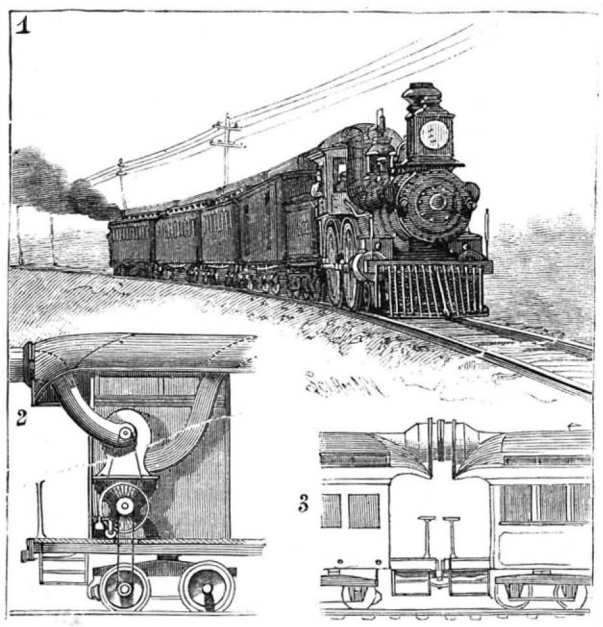
A SPARK CONDUCTOR FOR LOCOMOTIVES.

The accompanying illustration represents an improved device for discharging the smoke and sparks from a locomotive at the rear of the train, thus relieving the passengers of one of the great annoyances usually attendant upon railway travel. This invention has been patented by Mr. Edward J. Brandt, of Watertown, Wis. Pipes extend rearwardly from each side of the smokebox into a channel in the roof of the cab, this channel being connected by a coupling with a pipe in which telescopes one end of a flexible tube

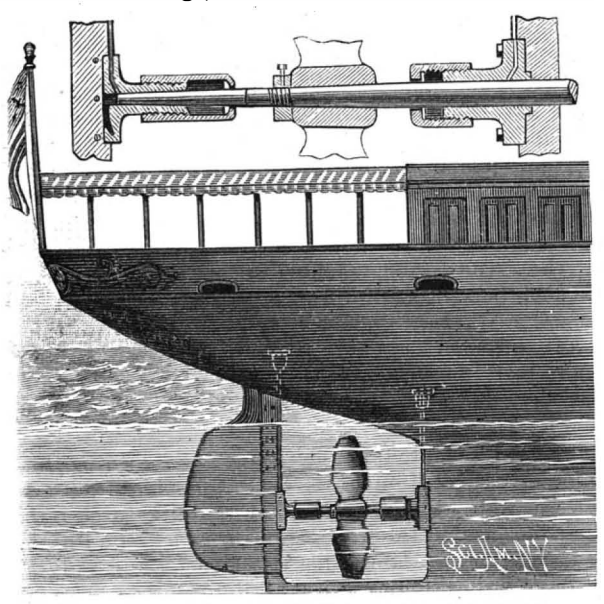


BRANDT'S SPARK CONDUCTOR.

connected by a second coupler with one end of a pipe held in the front end of the first car. This car is usually the baggage car, and is provided with an exhaust fan or blower driven from the car axle, as shown in Fig. 2. The pipe connection from the smoke box leads to this blower, and the smoke drawn in as the moving train operates the blower is discharged into a pipe leading upward into a channel formed longitudinally in the top of the car, this channel being made of sheet metal and forming the rounding top of the clear story of the car. At suitable intervals in this top are formed tubes through which pass ventilators to carry off the foul air and gases from the lamps in the car. The channels of two succeeding cars are connected with each other by couplings, as shown in Fig. 3, these couplings having flexible tubes and casings, and the last half coupling on the last car opens into the open air, where the smoke and gases are discharged in the rear of the train. When the train is at a standstill, at a station or other place, the smoke and gases escape in the usual manner through the smoke stack.

AN IMPROVED PROPELLER-SHAFT BEARING.

A propeller-shaft bearing in which oil is substituted for water bearings, and in which sand and other im-



RICHARDSON'S PROPELLER-SHAFT BEARING.

purities are kept from the bearings and their rapid wear prevented, is illustrated herewith, and has been patented by Mr. John Richardson, of St. Mary's, Ga. The propeller shaft is held in front of the screw in a bearing secured to the stern-post, and the shaft is lengthened beyond the screw to pass into a bearing secured to the rudder post. Both bearings have oil holes into which lead upwardly-extending pipes passing through the bottom of the vessel, each carrying an oil cup, by means of which the bearings may be conveniently oiled from the inside of the vessel. On the bearings, as shown in the sectional view are screw caps, serving to press to place a suitable packing material, and on the inside of each cap is a ring to exclude sand and dirt. In the outer bearing is a groove or pocket to accommodate any accumulation of waste oil. In case the propeller shaft terminates with the hub of the screw, it is designed to lengthen the shaft by joining a section to effect a bearing in the rudder post. This invention has had a practical test for a year past on the steamer Martha, a freight and passenger boat on the St. Mary's River, Ga., where the water was often so shallow that the boat had to be forced over shoals of mud and sand. The bearings, when recently examined, were found to be in perfect order, showing no signs of wear, and the boat has started on her second year's run with the same bearings that were originally put in place. The engines are also said to be in perfect line and to run two turns faster per minute than formerly, other conditions being the same. Capt. E. N. Stone, of the steamer St. Martha, and others familiar with the facts, bear testimony to the efficiency of this propeller-shaft bearing.

A Remarkable Centenarian.

The New Orleans papers have lately recorded the decease, at his farm near Reggio Station, parish of St. Bernard, La., of Mr. Celestin Paul, who lived to the great age of 118 years. His daughter, Mrs. Angele Soudé, is still living in New Orleans, and she has kindly furnished our correspondent, Mr. J. W. Bailey, of Washington, La., the following interesting letter of particulars concerning her father:

NEW ORLEANS, July 4, 1889.

Jonas W. Bailey, Esq.

SIR: In answer to your kind letter of inquiry about my father, I will respectfully state, what is well known from tradition by all the old residents of the parish of St. Bernard, that he was 18 years old when he went to reside on the place where he died. It is just 100 years ago. The oaks and pecan trees that he planted at that time are still there. Some of them cannot be embraced by two men. He moved only once from his old place. It was in the winter of 1814, when he found it safer to drive his cattle in the woods, far from the river, where the "Anglais," as he used to say, could not steal them. After the war he returned to his old place, where he remained up to his death. I left him on his place fifty years ago, while a young girl, to reside in New Orleans, where I had other relatives to take care of me. I, of course, visited him oftentimes, and always found him healthy. His reminiscences of men and things of his young days would have been very interesting for some historian; but I confess that I took little interest when he spoke to me about Lafayette, Jackson, Dominique Yon, etc. He used to speak very often of a Mr. Nolte, who was a merchant, I think, of New Orleans, who, he said, was a "big man."

His life has been that of a farmer. He was regular in his habits. After field work he would come home to take his meals, after which he would make baskets to send to the New Orleans market. I send you by express a specimen of those baskets. He made the one I send you during his late sickness.

With the regret that I could not give you all the necessary information you desire I am, sir,

Your respectful servant,

VVE. ANGELE SOUDE.

Prophesying Calamity.

In the SCIENTIFIC AMERICAN of July 6 appeared a paragraph in which J. E. Thickton expresses similar apprehension in respect to drilling the earth and exhausting the natural gas as is expressed by the following professors in a recent issue of the *Popular Science Monthly*.

Professor Joseph F. Jones assumes the earth to be a hollow sphere filled with a gaseous substance, called by us natural gas, and he thinks that tapping these reservoirs will cause disastrous explosions, resulting from the lighted gas coming in contact with that which is escaping. He compares the earth to a balloon floated and kept distended by the gas in the interior, which, if exhausted, will cause the crust to collapse, affect the motion of the earth in its orbit, cause it to lose its place among the heavenly bodies, and fall in pieces.

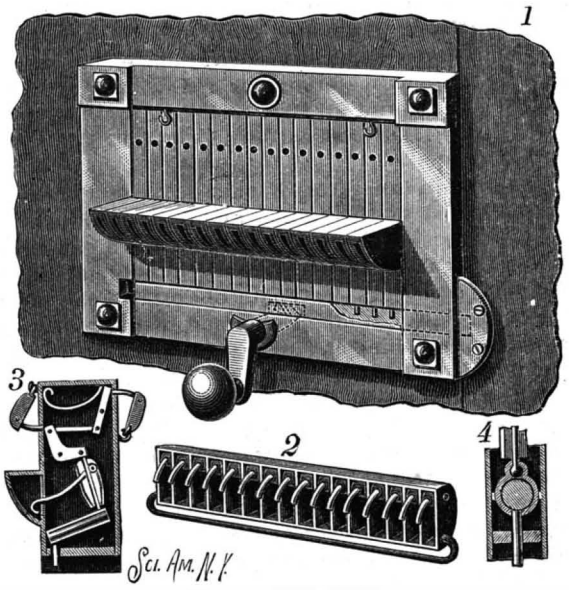
Another writer thinks that drilling should be prohibited by stringent laws. He, too, thinks there is a possibility of an explosion, though from another cause. Should such a disaster occur, "the country along the gas belt from Toledo through Ohio, Indiana, and Kentucky will be ripped up to the depth of 1,200 or 1,500 feet and flopped over like a pancake, leaving a chasm through which the waters of Lake Erie will come down, filling the Ohio and Mississippi valleys, and blotting them out forever."

Still another theorist has investigated the gas wells with telephones and delicate thermometers, and he announces startling discoveries. He distinguished sounds like the boiling of rocks, and estimated that a mile and one-half or so beneath the Ohio and Indiana gas field the temperature of the earth is 3,500 degrees.

The scientist says an immense cavity exists, and that here the gas is stored; that a mile below the bottom of the cavity is a mass of roaring, seething flame, which is gradually eating into the rock floor of the cavern and thinning it. Eventually the flames will reach the gas, and a terrific explosion will ensue.

AN IMPROVED LOCK.

A lock which has a series of pins for engaging and locking the bolt, and wherein all the pins may be moved in unison by means of a key, or one or more of the pins may be made to lock the bolt, rendering the key and knob inoperative, is illustrated herewith, and has been patented by Mr. Gabriel Neubrand, of No. 1002 O'Fallon Street, St. Louis, Mo. Fig. 1 represents an inside view of a part of a door and jamb provided with such a lock, parts being broken away, disclosing several of the locking pins in engagement with the bolt. Fig. 2 shows the key, and Figs. 3 and 4 are sectional views of one of the sixteen similar independent cases or compartments of which the lock is mainly composed. The bolt has a series of recesses or openings corresponding with the pins held in the pin projecting and retracting mechanism carried by the cases. The key consists of a rectangular frame, to a side of which is pivotally engaged an elongated link, the frame being made with a series of cross bars, between which are pivoted finger pieces or keys, secured to a rod whose ends are fixed in the ends of the frame, each finger piece or key being independently movable. A



NEUBRAND'S LOCK.

link and hooks are provided by which the key may be held in a horizontal plane, to more easily insert the finger pieces or key in the horizontal series of keyholes. The pins may be all simultaneously withdrawn by simultaneously inserting all the finger pieces or keys from either side, and when the pins are withdrawn the bolt may be moved by swinging the knob.

AN IMPROVED ASH SIFTER.

The accompanying illustration represents an ash sifter patented by Mr. Joseph W. Love, in which two screens are placed at an angle to each other, so that mixed cinders and ashes pass from the upper screen on to and over the lower one and are delivered into different receptacles. The device is made of galvanized iron and is perfectly automatic, no labor being required except that of putting in the ashes and cinders at the top. The body of the sifter has a hinged cover at the top and a sliding drawer at the bottom, with an upper and a lower screen arranged at right angles to each other.

The mixed ashes and cinders deposited in the top are partly separated by the first screen and more completely by the second one, the cinders being discharged from the side of the sifter and the ashes delivered into the drawer. An angular hood covers the lower screen and deflects the ashes falling from the upper

LOVE'S ASH SIFTER.

screen into side passages leading downward into the drawer.

For further information relative to this invention address Messrs. Beck & Love, No. 20 South Gay Street, Baltimore, Md.

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THE PARIS EXHIBITION.

EXHIBITS OF THE FRENCH TECHNICAL SCHOOLS.

PARIS, July 29, 1889.

The largest of the above exhibits is that of the Ecole Centrale des Arts et Manufactures et ses Anciens Eleves, the exhibits consisting of a great number of drawings and models, the chief of which are as follows: There is a model, about 26 inches long, of a beam engine (condensing), in which the bodies of the cylinders and pumps are made of glass, so that the motions of the pistons can be seen. Another model is of a compound marine engine, shown in section through the center of the cylinders. The high pressure cylinder has a Meyer adjustable cut-off valve, while the low pressure cylinder has a flat D valve. The model is worked by a handle on the end of the crank shaft. Another model is a gun and carriage mounted on a turret, which is made in section. A model that is well enough made to have been made by expert journeymen workmen is of the transatlantic steamship Bretagne, the model being about 10 feet long. Among the minor models are an injector in section, a connecting rod complete, and some ordinary flat keys for pulleys. There is also a model of a stationary boiler about 2 feet high, and of a locomotive 3 feet long. It is a six-wheel coupled engine with outside cylinders; the link motion has Crampton eccentrics and a straight link, the reversing motion lifting the link while simultaneously depressing the valve spindle, the construction being shown in Fig. 1, in which *a a* are the eccentric rods, *b* the straight link, *c* the lifting shaft, *d* a suspension link, and *e* a link from the arm, *f*, of the lifting shaft to the rod, *g*, which connects to the valve rod or spindle.

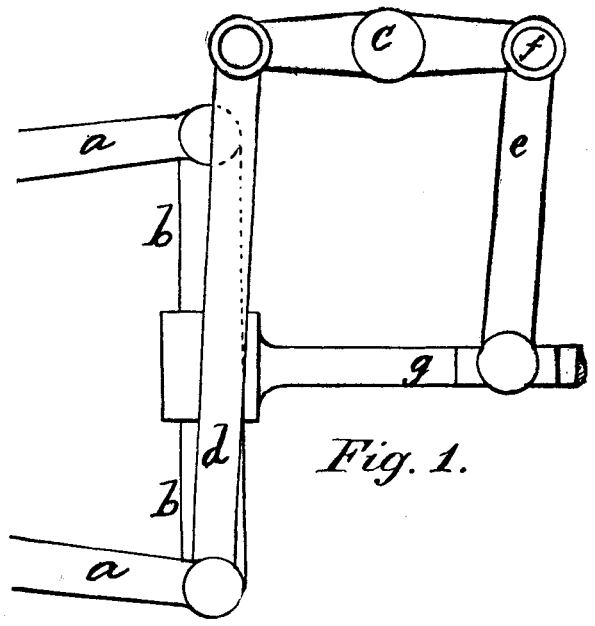

Fig. 1.

Looking at the engine from one side, it appears complete, but it is seen from the other side that the boiler is in section, vertically, the tubes, water, fire, fire bars, etc., being represented by paint. Among the other models is a plant for well boring, with the tools, etc. A model of one each of Arby's gang saw machines, band sawing machine, circular saw machine, and copying lathe for wood work. A piston, an eccentric and strap, a screw jack, and a pump bucket are made full size.

Among the drawings in this exhibit there are three views of a centrifugal ventilator, and under the heading of Traveau de Vacances we have drawings about 2 feet 6 inches by 2 feet of the engines of the Transatlantic steamships Bretagne and Champagne. These drawings contain an end elevation with the condenser in section; an end elevation with the steam cylinders and air pump in section; a front elevation with the cylinders, valves, crosshead, eccentrics, and lower connecting rod, end of one engine shown in section, the other engine not being shown in section. The crank is shown broken off, put outside the engine hand-turning gear. The plan shows one high pressure and one low pressure cylinder in cross section. Separate drawings are given of the air and circulating pumps and of the bilge pump, which are shown in section and in plan. Another set of drawings are of a paper-cutting machine, and include a side elevation and plan, with two sheets of details. Yet other drawings have architectural and artistic subject matter. Taken altogether, this is a large and splendid exhibit, reflecting the highest credit upon the school.

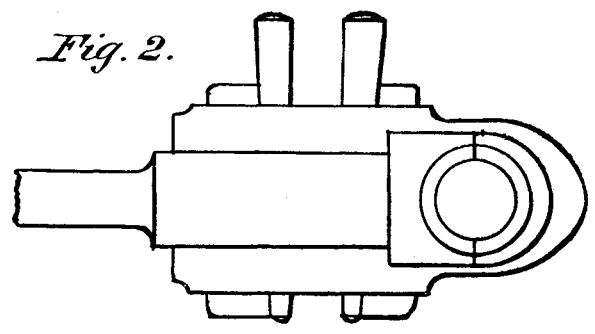
Fig. 2.

The Ecole Industrielle des Vosges exhibits a pattern of an 8 foot flywheel that is well made, and a connecting rod end of the design shown in Fig. 2, the double set of keys and gibs dispensing with the use of liners, while enabling the wear to be taken up without altering the length of the rod. To some other of the items in this exhibit, however, considerable exception may be taken, so far as the designs are concerned (the workmanship being very commendable throughout). Examples are given in Figs. 3 and 4, which represent stocks and dies for thread cutting by hand. In Fig. 3 *a* is a plate for holding the dies in the stock, and *b c* are screws for securing this plate. The slotted holes, *d e*, enable the plate to be slid down (when *b c* are loosened) and passed over the screw heads. It is hard to find a valid reason for the employment of two set screws for the dies. The construction in Fig. 4 is equally objectionable, it being hard to find an excuse for both handles being screwed to operate on the dies, while the plate, *a*, with its screwdriver screws are cumbersome and unhandy. It is hardly necessary, perhaps, to call your readers' attention to the fact that any one of the American makes of this tool are less expensive to make, easier to handle, and enable the dies to be changed much quicker. The dies, as shown at G, taper on their sides, which is an unnecessarily expensive form to give them. A crank in this same exhibit is shown in Fig. 5, the surface at *a* being circular and more difficult to make, while no better than if it were flat, as is usually the case. The next exhibit (all these exhibits being described in the order in which they are exhibited) is that of Aux Forges de Vulcain, and contains a back gear, gap, screw-cutting lathe, with cast gear trimmed with a file. Silence is the most generous course to adopt with regard to this exhibit. In the Ville de Troyes Ecole Professionelle exhibit is a vertical machine that may be used for drilling, routing, or milling, the workmanship of which is really excellent except the gear for elevating the table, and it is hard to see how anybody who could do the rest of the work so well could do this part so indifferently.

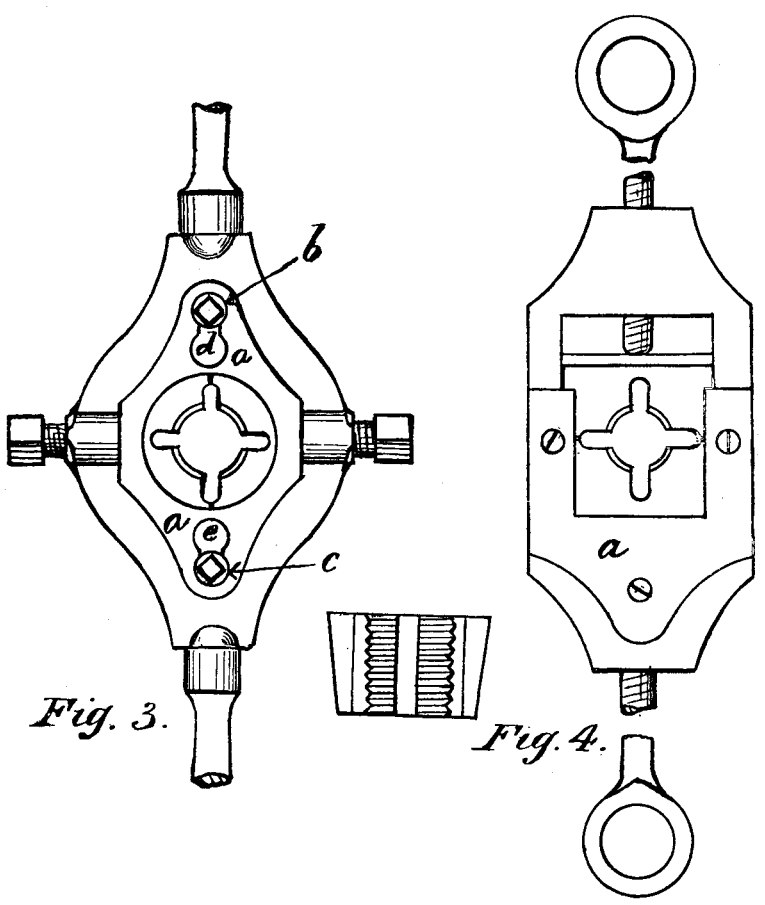

Fig. 3.

Fig. 4.

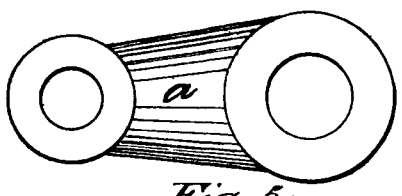

Fig. 5.

The Institut Bertrand, Versailles, exhibit some good examples of wood working and containing patterns in oak for hand wheels such as are used on machines, brackets, and various forms of joints for wood work; and in this connection it may be remarked that pine, mahogany, or cherry, the three woods employed for patterns in the United States and in England, find but very little place among the pattern work in this exhibition. The exhibits in iron work of the above school contain cubes, hexagons, parallelograms, spanners, wrenches, a head and tail stock for a lathe (made by a boy of 16 years old), and a working skeleton model of an engine with a link motion, all being well executed. The exhibit of the Ecole Superieure de Commerce et Industrie Bordeaux contains patterns for gear wheels and eccentrics, a model of a part of a winding staircase, a double drilling machine, and a small milling machine. The drilling machine frame is U shaped at the top, and cone pulley is in the U of the frame. At one end of the cone spindle is a bevel gear for a fast running spindle for small drills, and at the other a similar gear for a slower running spindle for larger drills. A foot feed is given to the table for the fast spindle, and a ratchet foot for the slower running spindle, the ratchet being worked by an eccentric on the spindle. The work table on this side of the machine consists of a vise on a table that is movable along a slide standing vertical, after the manner of a shaping machine. I omitted to say that when one spindle is at work the other remains motionless, as the gears throw in and out, and that the difference in the spindle speed is obtained by using different diameters of gear wheels and pinions. These gears are cast and not cut, an objectionable feature found in too many English as well as French machines. The Ecole d'Apprentisage du Havre exhibits a 20 horse marine engine made by boys of from 14 to 16 years old that looks thoroughly well made and proportioned, and also some work in glass cases, such as dies, vises, scribing blocks, etc., most of the designs being quite indifferent, to say the least. We now come to an exhibit that contains a lathe of a design one would scarcely expect to find among the civilized nations of our day. It is by the Societe Industrielle de St. Quentin. On the end of the back gear spindle is a crank handle, and the back gear consists of a single spur wheel gearing with a single spur wheel on the live spindle of the lathe. These two gears are of equal diameters. Hence one turn of the crank handle gives one turn to the live spindle, and as the lathe will take in work of not more than 12 inches, and 2 feet long, it is difficult to conceive of any field of usefulness for this lathe. If there were even change gears to increase the speed of the live spindle for small work, the ridiculousness of the design would be less glaring; but no—there is not a single redeeming feature to this monstrosity, which, by the way, is provided with a compound slide rest and a lead screw for screw cutting and automatic feeding.

In contrast to this is the exhibit of the Ecoles Nationales d'Arts et Metiers, in which are examples of castings and forgings that are simply superb for apprentices' work. Among the forgings is an 8 foot stern post for a vessel, and a fork end connecting rod about 6 feet long, and various examples in arm and lever work. One of these examples is shown in Fig. 6, one arm being left unwelded, and here there is a blunder, as the scarfing for the weld is hollow, as at A, Fig. 6, instead of being rounded as at B, which would cause all the dirt and scale to squeeze out instead of being pocketed in the weld. The castings include cone pulleys, sheaves, brackets, and ornamental pieces such as pine cones, shields, a human hand, etc. The Ecole d'Aix exhibits a crank planer of good proportions and well made except the scraping, which is, I am bound to say, however, quite as good as some I have seen in the United States. The Ecoles Nationales d'Arts et Metiers, Ecole de Chalons, exhibit the only example of cut gears which appear to be well done, but there is so much backlash or play in the teeth that they cannot be tested by hand. The exhibit consists of a pair each of involute and epicycloidal bevel wheels, about 10 inches diameter and 1 inch pitch, a pair each of involute and epicycloidal spur wheels, 10 inches diameter and 1 inch pitch, an internal gear and pinion with epicycloidal and one with involute teeth, a worm and worm wheel having involute and one with epicycloidal

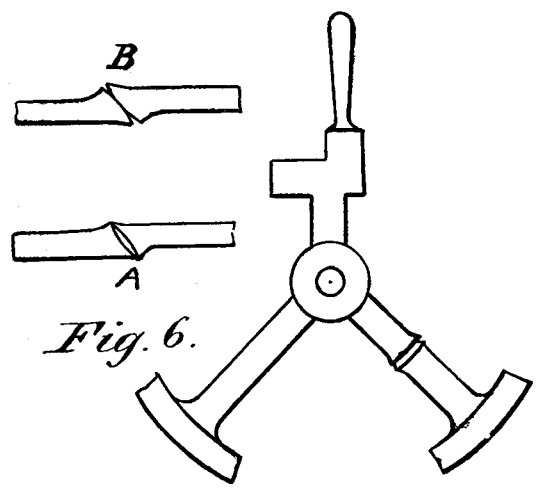

Fig. 6.

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teeth, and a rack and pinion with epicycloidal and one with involute teeth, the pinions being about 6 inches diameter. This is, it will be seen, a large and well arranged exhibit, and it is a pity they did not follow the Pratt & Whitney Company's example (when they exhibit gear wheels), and make the teeth fill the spaces, so that the quality of the gearing could be tested by hand. This same exhibit contains a remarkably fine piece of workmanship that I will undertake to say not more than one workman in five hundred could equal. It consists of a number of links connected together somewhat after the manner of a parallel motion, but containing in all some thirty knuckle joints, many of which are compound joints and so accurately are these joints fitted that it is impossible to give the faintest perceptible motion to the arm at one end without communicating the same amount of motion to the joint at the other end, and the skill displayed in making these joints will be appreciated when it is stated that some of them contain six separate pieces in the one handle joint, hence all these pieces must be dead the same length or the pins would not go through without bending the slender links. Again, as some of the links attach to pivots fixed on a framing, the alignment also of each piece must be dead true. There is a handle and crankshaft provided for testing this piece of work, and I never saw anything better designed for its purpose or more perfectly done.

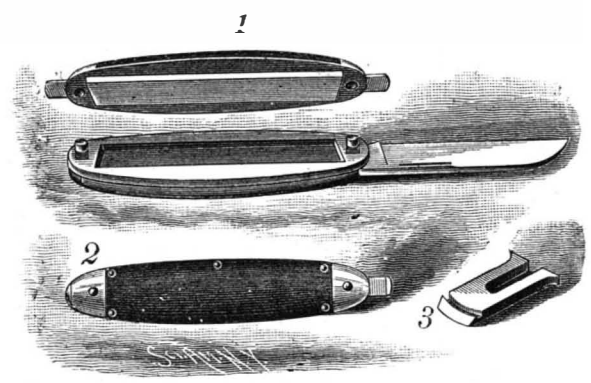
On a drilling machine in this same exhibit I find all the gears have involute teeth, which are more used on the larger wheels in France than in the United States or England.

The Ecole Nationale d'Arts et Metiers, Chalons sur Marne, has among its exhibits some queer examples of designing, the most noted being a lathe such as I have already described, the driving motion being a hand crank on the back gear spindle and a pair of spur gears. In the section from Angers I find a gap lathe with 9 inch centers having cast back gears and cast feed gears. The feed spindle is at the back of the lathe, but the feed motion is carried by a spindle across through the carriage to the front of the lathe, as it is in many English lathes. There is a clutch motion with cast gears at the headstock end of the feed rod beneath the back gear. The lead screw for screw cutting is driven as follows: A pair of cast gears at the headstock end drives a rod that is low enough beneath the headstock to pass beneath the gap of the lathe bed; at the tailstock end of the bed it gives motion (by means of a pair of cast spur wheels) to the lead screw, which extends (inside the bed) nearly to the gap. All this roundabout construction comes from giving to a gap lathe a rod feed and a lead screw, as though a utility lathe of this kind ought not to be satisfied with one feed motion, especially since the gears are cast and accurate thread cutting is therefore out of the question. A compound slide rest is employed, being provided with an eccentric motion for throwing the tool out in screw cutting. On another lathe in this same section, I find an application of Professor J. E. Sweet's height-adjusting device for lathe tools, the gib being let into the ends of a compound rest.

JOSHUA ROSE.

AN IMPROVED POCKET KNIFE.

The accompanying illustration represents a whetstone combined with a pocket knife in such a way that the stone may be readily removed from the knife and placed in position for use. The invention has been patented by Mr. William Brede, of Hamakua, Hawaii. The knife has at one side of the handle lining a chamber for receiving a whetstone, as shown in Fig. 1, which also shows such whetstone attached to one of the cheek pieces of the handle, but removed from the knife. The rivets at the ends of the handle are prolonged



BREDE'S POCKET KNIFE.

beyond the chambered plate which receives the whetstone, and have studs with notches for receiving a fastening slide, shown in Fig. 3, the knife with one of the slides withdrawn being shown in Fig. 2. The entire withdrawal of the slides from the handle is prevented by lugs engaging shoulders in the end pieces.

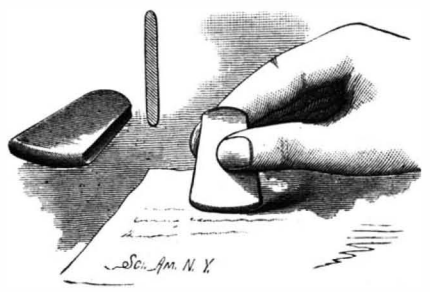
Persons contemplating building will find it to their advantage to subscribe for the Architects and Builders Edition of the "Scientific American." $2.50 a year. Single copies 25c.

California Borax.

New borax works have recently been started in Saline valley, Inyo county. They have eighteen crystallizing tanks, each of a capacity of 1,000 gallons. Three of these tanks are emptied daily, yielding about two tons of borax. The crude material from the borax marsh is first boiled in a boiler of 3,000 gallons capacity, and the solution is then run off into the tanks, where it is allowed to cool off and crystallize for about six days. The borax accumulates on the zinc sides of the tanks, and on plates of that metal hung in them, seven plates being used to each tank. The works are about fifty-five miles from Alvord station, and are close to the great Inyo mountains, which rise like a wall to a height of 11,000 feet above the sea level.

AN IMPROVED INK ERASER.

An ink eraser made of metal, and designed to be more efficient and convenient than the erasers in general use, is shown herewith, and has been patented by Mr. Charles W. Johnston, of No. 735 West Main Street, Louisville, Ky. It is shown in perspective and section, and is preferably made of steel, or with steel working surfaces. Its wider end forms the erasing surface, and



JOHNSTON'S INK ERASER.

is of rounded or convex shape in two directions, and dressed as files are, being cut to such a degree of fineness as the character of the paper it is to be used upon requires. The opposite end of the eraser is similar in shape, but is left smooth to form a glazing surface for restoring the finish of the paper where erasures have been made.

Loss of Light through Windows.

Some interesting experiments have been undertaken by Herr Herzberg, with the co-operation of Herr G. Schulze, chief engineer of the Berlin works of Messrs. Frederick Siemens & Co., for the purpose of ascertaining the loss of light in passing through window glass of various kinds in general use. The experiments were conducted with a Bunsen photometer, in which two Argand gas burners of equal illuminating power were placed at the two ends of the graduated bar. After equality of illumination of the screen had been established, a plate of the glass to be tested was interposed between one of the end lights and the screen, and the extent of the displacement of the latter thus necessitated for the re-establishment of equality of illumination on both sides gave the measure of the opacity of the glass. A simple translucent but not transparent glass showed a loss of 27 per cent of light. Cathedral glass, such as is used in stained glass work as a basis, being clear but with a slight ground tint, showed a loss of 12⅞ per cent. Plain cathedral glass with a white tint also showed a loss of 12⅞ per cent. Plain white Rhenish "double glass" gave a loss of 10 per cent. Plain thin mirror glass obstructed 10 per cent of light. The two last together, with an interval of six centimeters between them, showed a loss of 21 per cent. Cathedral and Rhenish "double glass" together, with the same interval, showed a loss of 23 per cent. A ground glass with cut stars together with a white background, such as is found in house fanlights, obstructed 60 per cent of light. A new clean piece of ground glass without stars, together with the dusty white glass background as in the preceding experiment, showed a loss of 40 per cent.

Casting Plate Glass.

The casting tables, the most important pieces of apparatus in a plate glass works, are 19 feet long, 14 feet wide, and 7 inches thick. Each is provided with an iron roller 30 inches in diameter and 15 feet long. Strips of iron on each side of the table afford a bearing for the rollers, and determine the thickness of the plate of glass to be cast. The rough plate is commonly nine-sixteenths of an inch in thickness; after polishing it is reduced to six or seven sixteenths. The casting tables are mounted on wheels, and run on a track that reaches every furnace and annealing oven in the building.

The table having been wheeled as near as possible to the melting furnace, the pot of molten glass is lifted by means of a crane, and its contents quickly poured on the table. The heavy iron roller is then passed from end to end, spreading the glass into a layer of uniform thickness. The whole operation of casting scarcely occupies more time than it takes to describe it. Each movement is made with almost nervous rapidity. Few industries offer such fine scenic display as the pouring of molten glass. One feels like crying "Encore!" it is so very brilliant.

In contact with the cold metal of the table the glass cools rapidly. As soon as possible the door of the annealing oven is opened and the plate of glass introduced. The floor of the oven is on the same level as the casting table, so that the transfer can be conveniently and quickly made. When, after several days, the glass is taken out of the oven, its surface is found to be decidedly rough and uneven. A small quantity is used in this condition for skylights and other purposes where strength is required without transparency. It is known in the market as rough plate. The greater part of the glass, however, is ground, smoothed, and polished before it leaves the establishment.—*British Mercantile Gazette.*

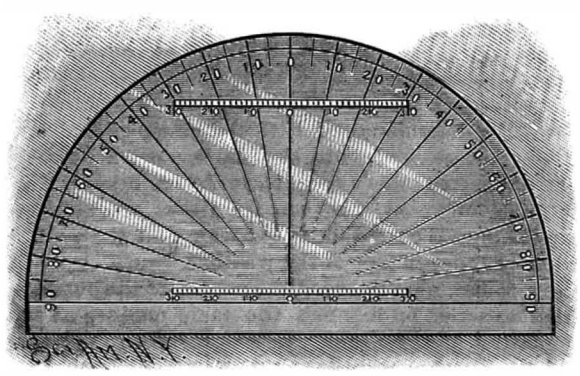
Bacilli.

At a recent meeting of the Amsterdam Royal Academy of Sciences, M. Forster treated of the influence of our common salt on the life of pathogenetic bacteria, and stated that, from many and various experiments, he had come to the conviction that whereas cholera bacilli are very sensible to that salt, and when brought into contact with it very soon die, the typhoid and pyrogenetic bacteria, the bacilli of tuberculosis, and the cattle distemper bacilli may remain for months buried in common salt without losing their powers of growth and reproduction. The salting of butchers' meat may, therefore, in some cases prove ineffectual. M. Forster further exhibited some preparations, obtained in the hygienic laboratory, which went to prove that neither the bacilli of tuberculosis nor cholera bacilli can develop under the influence of iodoform vapor.

AN IMPROVED DRAUGHTSMAN'S PROTRACTOR.

In plotting the courses of a deed or the meanders of a watercourse, the surveyor is compelled either to draw a new meridian at the close of each course, from which to lay off the succeeding one, or else to calculate the angle made by the intersecting courses and then lay off this angle with an ordinary protractor. The latter method is not only laborious, but there is also the liability to error in such computation, and, as each course is dependent upon that which precedes it, an error in one course will be carried forward throughout all the successive courses. Gen. Duffield's patent protractor, illustrated herewith, enables each course to be laid off independently of all others. It is made of horn, celluloid, or other transparent material, and the graduation upon the outer circumference in degrees, etc., like that of the surveyor's compass, begins at 0° on the vertical line, and extends both ways to the right and left to 90° on the horizontal line. Below or on this horizontal or 90° line, and parallel therewith, a scale of equal parts is drawn, the graduation commencing with 0, at the intersection of the vertical or 0° line and the horizontal line, and also extending each way both right and left.

A similar scale of equal parts is drawn parallel with the first, as far removed from the horizontal or 90° line as the graduation of the outer circumference will permit, the 0 of such scale being at the intersection of the vertical or 0° line with the horizontal line, upon which this scale is drawn, and the graduation also extending each way, both right and left. To use this protractor meridian lines are drawn in pencil upon the paper upon which the map is to be drawn, whose distance apart will not exceed 3 inches, or the length of the scale of equal parts, drawn on the protractor. To lay off any given course, the center of the protractor is made to coincide with the beginning point of such course on



DUFFIELD'S DRAUGHTSMAN'S PROTRACTOR.

the end of the preceding course, and the protractor revolved about its center until one of the pencil meridians on the map intersects each scale of equal parts on the protractor at the same point. The vertical or 0° line of the protractor will then be parallel with the meridian, and the given course can then be laid off from the graduation upon the outer circumference. For other information relative thereto address Gen W. W. Duffield, Pineville, Bell County, Ky.

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THE NEW U. S. CRUISER PHILADELPHIA.

"What is the first step taken toward the construction of a cruiser like the Philadelphia?" repeated a member of the ship-building firm of Cramp & Sons, Philadelphia. "Well, the first thing to be done is to secure the contract."

Now commences the work—not the actual work of building. It will be from four to six weeks after the time of the granting of the contract before everything is in readiness for that. The plans and specifications which are furnished by the government are taken to the moulding office. The first work is the laying down, in the actual size and shape, on the immense floor of the moulding loft, every piece of material used in the construction of the ship. Keel, frames, stern and stem posts, plates for decks and sides, each particular part is taken in its turn and "laid down" on the floor, and careful drawings made. Here the ship lines are formulated. An idea of the amount of work to be done can be gained by a glance at the accompanying illustrations Nos. 5, 6, and 7. Each one of these frames and deck beams is different from all the others. Each one is laid down in turn and its dimensions and curvature determined.

From the dimensions thus ascertained, the quantities of the materials needed are decided upon and ordered. Then, at last, upon the arrival at the yard of this material, actual work begins. Heavy wooden blocks are placed at regular distances apart in a line leading down the dock to the water, and on these blocks the keel is laid. The keel is made up of many plates riveted together. When this is in place, the stem is next adjusted, as shown in illustration No. 2. This last piece, unlike the keel, is a solid casting. Now can first be seen some slight resemblance to the shape of a ship. In the meantime the frames, which are straight when they arrive at the yard from the steel works at Phœnixville, have been bent into shape. To raise these frames into position is the next step. These frames in place are clearly shown in illustrations Nos. 3, 5, and 7. When the deck beams are placed in their position, which follows next in order to the erection of the frames, the form of the hull is shown in skeleton.

A part of the upper deck frames are shown in illustration No. 6. All these upper deck works, by the way, are built as a superstructure upon the protective deck, which has, of late, become one of the most important features of ships of this class. Illustrations Nos. 4 and 6 give a good idea of this deck. "That deck," said Mr. Andrew Cramp, one of the members of the firm, "is almost absolutely shot-proof."

At this stage, the good ship's skeleton stands bare and naked, and presents a rather ghastly aspect in the moonlight, but from early morning till dusk the hustling forms of many men, their cheery voices and sounding blows, drive all such ideas away. A month has been consumed in the erection of the frames and beams. A close watch is kept over the time taken for the completion of the different parts of the work. At the commencement the time was portioned out, and it will not do to allow any one part of the work to use up more than its allotted time.

So the work goes on, day after day, month after month—rain or shine—nothing is allowed to interfere or interrupt. Just at this time about one hundred and fifty men are constantly at work on the hull itself, while in the different departments of the yard, engaged in preparing the material for the construction of the ship, doing all sorts of preliminary labor, four hundred men are kept busy.

Car load after car load of steel plates have been arriving at the yard from the famous foundries of Pittsburg. They have been laid aside until needed. Now everything is in readiness, and the plating of the deck commences. Three separate gangs of men are engaged in this work. The first gang in the shop punch the rivet holes in the plates. One by one the plates are then placed in position by a second gang of laborers. No sooner is this done, when the third gang puts in its appearance and proceeds to rivet the plates together and to the deck beams. These men are the noise creators. Big hammers and little hammers pound and pound; some are beneath the plates, some are above. Each one seems to be trying to outdo the other. This continues for weeks, and then the decks are finished. Now the ship is roofed in, so to speak, and the work is still more independent of the weather.

Now comes, next in order, the plating of the outsides, which is carried on in much the same manner as was the plating of the decks. It is slow work. Not only must the joinings of the plates be of sufficient strength to withstand the rough usage to which they are liable to be subjected; but they must also be watertight. Each joint is carefully tested and proved. Six months are consumed in this slow and laborious labor of plating. It is now eight months from the time of the granting of the contract. The rubbish is partly cleared away. The hull is given several coats of paint. Things in general are put a little ship-shape, and then she is ready for launching.

The actual work of building a steel ship is somewhat monotonous. It is simply a slow, careful, and laborious putting together of many different parts. The art of ship building is all exercised in, first, the designing of the model and plans by the ship's architect, and, second, in the faithful following of the architect's model and measurements in laying down on the mould loft's floor each particular part, so that not only the measurements will be mathematically correct, but that the "lines" may all be reproduced with a delicate exactness.

Once the drawings are truthfully made and the exact dimensions of each part arrived at, the rest of the work is simply a mechanical reproduction; true, it must be done by most capable hands under most careful supervision. The builders themselves are not the only supervisors of government work. The navy department has its representatives constantly on hand, superintending, overseeing, keenly watching everything that is done. Every part of the work must be submitted to and passed upon and approved by them. At Cramp's ship yard, Assistant Naval Constructor Hanscom has charge of the government's interests. He has quite an extensive corps of assistants of draughtsmen and engineers. Their responsibility is great, and they are constantly on the alert.

All the while the hull was being put together, in other parts of the establishment another most important operation was going on. The designs for the engines are furnished by the government with the designs for the ship, as in the case of the Baltimore, whose engines were designed in Europe. The builders, however, are at times allowed to design their own engines, as will be the case with the Philadelphia.

"We prefer," said Mr. Cramp, "to design the engines ourselves." The engines of the Philadelphia must show at least 8,000 horse-power. The boilers and engines, as has already been said, designed by the Cramps, are built in their yard.

The next work is the placing of the boilers and machinery. There are the main and the auxiliary engines. Air pumps to send fresh air down to the engine rooms, and bilge pumps and fire pumps. The immense shafts, fifteen inches in diameter, and the two propellers, each fourteen feet in diameter, are to be placed in position.

There is an immense amount of machinery about a ship of this description. The boats are hoisted and lowered by steam. The windlass can be worked either by hand or by steam, and the steering apparatus has equal facilities. Then there is the electric lighting and the electric bells. One of the last touches is the putting in of the military masts and the rigging. Arrangements are made for the reception of the heavy armament, and then follows a general finishing all over.

This work generally occupies about six months more from the time of the launching. Hundreds of men are busy in the ship. Engineers, machinists, electricians, carpenters, joiners, upholsterers, all are working at once. Then comes the time for testing the different parts of the vessel. First the engines are given a private dock trial. With the ship securely tied up at the wharf, the engines are run for days at a time. Defects, if there be any, are noticed and remedied. All the other work is going on, and finally, when the last touches have been made, the new cruiser steams down the river on her unofficial trial trip.

Some slight alterations almost always follow the experimental tests to which the ship has been put. In a couple of days, once more she is tied up at her place at the dock. Once more she is invaded by the workmen. If the builders are satisfied that, when the alterations are completed, she will answer the requirements, they will then notify the navy department, and a day will be set for an official trial, when the ship will be put through most severe tests under departmental supervision. If the result of this trial is satisfactory to the department, the ship is then formally accepted and turned over to the government. She then passes out of the builders' hands. From fourteen to eighteen months have passed since the granting of the contract. The ship is taken to one of the navy yards, where she receives her armament, her small boats, and the numerous other necessities essential to her perfect equipment. When this is finished, she is ready to be put in commission.

Chrome Iron on the Pacific.

The Santa Rosa *Republican* says: "A specimen of chrome iron ore, taken from the surface of the lands of J. D. Cooper, about ten miles north of Fort Ross, near the Plantation House, indicates there must be a valuable deposit of this mineral in that vicinity. The piece exhibited by Mr. Cooper, and picked up by him as a cropping, is almost pure mineral, no steel chisel or sledge hammer having any effect upon it. If, as is supposed, there is a ledge of this ore in that locality, it will, when developed, add largely to the mineral wealth, not only of the country, but of the State, as this mineral is not only valuable, but rare. In the same vicinity a considerable deposit of almost pure bitumen has also been found. Being but about three miles from the coast, these deposits may become the means of making that part of the country rich and valuable.

Correspondence.

The Bowers Dredger.

To the Editor of the Scientific American:

A communication from Tacoma, in your issue of the 13th inst., says the Bowers dredger there has work enough to last for three years, or until it is worn out. This gives a very wrong impression. There are parts in all dredgers that require frequent replacing, while the dredgers themselves last twenty or more years. These parts, in the "Bowers dredge," are fewer than in most others, being mostly limited to the cutters, pipes, and large pump. These may require replacing wholly or in part in even less than three years, while the dredge, as a whole, being free from the enormous shifting strains that constantly rack most other dredgers, should certainly last as long if not longer than they.

A. B. BOWERS.

1110 Eighth St., N. W. Washington, D. C.,
July 17, 1889.

To Restore the Freshness of Worn Clothing.

The mystery to many people how the scourers of old clothes can make them almost as good as new is explained in the *American Analyst* as follows: Take, for instance, a shiny old coat, vest, or pair of pants of broadcloth, cassimere, or diagonal. The scourer makes a strong, warm soapsuds, and plunges the garment into it, souses it up and down, rubs the dirty places, if necessary puts it through a second suds, then rinses it through several waters, and hangs it to dry on the line. When nearly dry, he takes it in, rolls it up for an hour or two, and then presses it. An old cotton cloth is laid on the outside of the coat, and the iron passed over that until the wrinkles are out; but the iron is removed before the steam ceases to rise from the goods, else they would be shiny. Wrinkles that are obstinate are removed by laying a wet cloth over them, and passing the iron over that. If any shiny places are seen, they are treated as the wrinkles are; the iron is lifted, while the full cloud of steam rises, and brings the nap up with it. Cloth should always have a suds made specially for it, as if that which has been used for white cotton or woolen clothes, lint will be left in the water, and cling to the cloth. In this manner we have known the same coat and pantaloons to be renewed time and again, and have all the look and feel of new garments. Good broadcloth and its fellow cloths will bear many washings, and look better every time because of them.

Fir Stronger than Oak.

Some very interesting tests of woods native to Washington and others native to other timber sections of the country was made recently at the Northern Pacific car shops. The purpose was to demonstrate the relative strength of the woods.

There were present at the tests, master mechanics Warner and Phipps, of the shops, engineers Lund and Haines and architect C. B. Talbot.

The timber tested was subjected to an actual breaking, on sticks 2×4 inches and four feet long, to centers, being one-fourth as long, thick, and wide as an actual stringer as used by the railroad company in its trestle bridges. The test is important, as there seems to have been but little information on that subject, and the impression has been that ordinary oak was stronger than fir. The tests show, however, that yellow fir is actually one-third stronger than Eastern oak, and more than one-half stronger than Eastern white pine. The breaking weight, placed squarely in the middle of each stick, was as follows:

No. 1. Old piece of yellow fir from yard, having decayed ends, six years in the weather, 3,063 pounds.

No. 2. New soft piece fine grain yellow fir, similar to the best flooring timber, 3,062 pounds.

No. 3. Old piece yellow fir, coarse grain and hard, broke short at 4,320 pounds.

No. 4. New piece from the butt of tree, coarse grain, broke with a stringy fracture at 3,635 pounds.

No. 5. New piece Michigan white pine, soft and clear, broke short at a weight of 1,610 pounds.

No. 6. New piece Michigan oak broke nearly short off at a weight of 2,428 pounds.

All of the pieces of wood were subjected to the same clear span of 3 feet 9 inches, and the weight applied exactly in the middle.

As to the deflections the following notes were made: Nos. 1 and 2, half an inch, No. 3 three-eighths of an inch, No. 4 five-eighths of an inch, No. 5 one-fourth of an inch, No. 6 one and one-eighth of an inch.—*Tacoma Daily Ledger.*

Treatment of Patients under Chloroform.

In France, when a patient is under chloroform, on the slightest symptom appearing of failure of the heart, they turn him nearly upside down, that is, with his head downward and his heels in the air. This, they say, always restores him; and such is their faith in the efficacy of this method, that the operating tables in the Paris hospitals are made so that in an instant they can be elevated with one end in the air, so as to bring the patient into a position resembling that of standing on his head.

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VIEWS ON MT. HOOD.

We have already published several views of Mt. Hood, the boast and pride of every tourist who has visited the Western coast. The accompanying views give a good idea of the cone-shaped white-clad summit, while the grim, grewsome wildness of the fierce pinnacle

PHOTOGRAPH TAKEN FROM SUMMIT OF MT. HOOD.

itself is well shown in the other view. The height at this point is over 14,000 feet above the sea level.

Natural Gas.

The first recorded discovery of a natural gas well in the United States resulted from borings made within the present limits of the city of Charleston, S. C., in 1815, but in this case the gas does not appear to have been put to any use. In 1821 natural gas was discovered issuing from a spring at Fredonia, N. Y. This discovery was made by a woman who had gone to the spring one dark night to draw some water in a pail. In order to aid her in doing this, she put down a lantern, when the gas which was rising from the spring took fire. This alarmed the woman, who hastily dropping both pail and lantern, ran back to her home as fast as possible. This gas was first collected by excavating and covering the spring. It was then conveyed into a small holder made of copper, and from thence to one mill and several stores, where it was used for light. This was the first practical use of natural gas in the United States. When Lafayette passed through the village in 1824, the hotel called the Taylor House was illuminated with this gas in honor of this distinguished man. The well is said to be producing yet, and Fredonia is still lighted by natural gas.

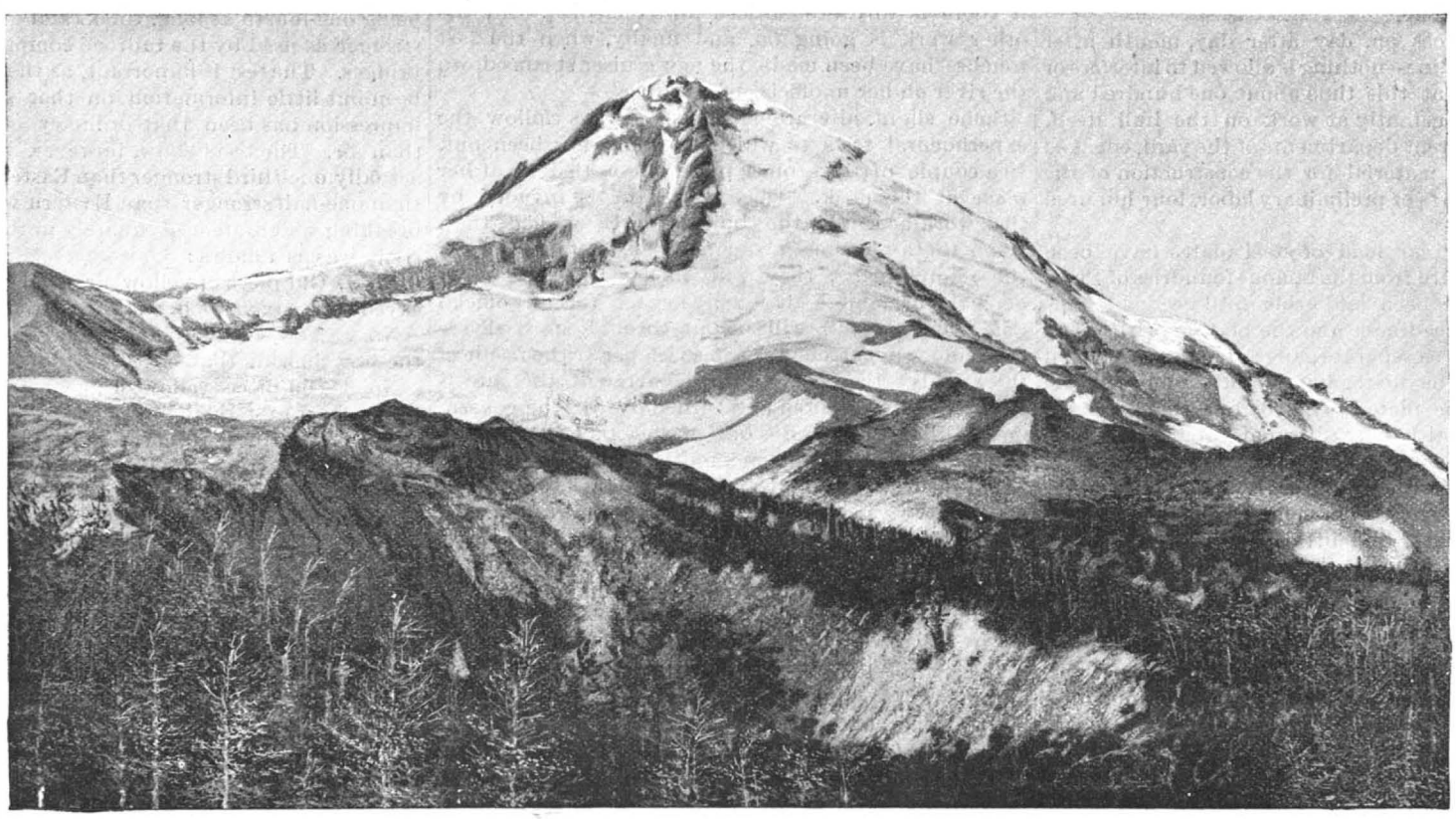
Carbo-Dynamite.

Carbo-dynamite is one of the later developments of nitro-glycerine compounds, and is the invention of Mr. Walter F. Reid and Mr. W. D. Borland, its most striking feature being a very high percentage of useful explosive effect. It is composed of ninety parts by weight of nitro-glycerine absorbed by ten parts of a variety of carbon, the great porosity of which is indicated by its absorbing power. Nor is the high rate of absorption it possesses its only good mechanical feature; it is extremely retentive, which adds greatly to its value as an explosive agent. It possesses several important advantages over ordinary dynamite, which consists of 75 per cent of nitro-glycerine mixed with 25 per cent of kieselguhr. This latter is an infusorial earth, which, being incombustible, cannot add to the force of the explosion, and must be looked upon as an adulterant of the nitro-glycerine, so far as explosive effect is concerned. Carbo-dynamite, on the other hand, not only contains 15 per cent additional nitro-glycerine, but the absorbent substance, besides acting as a safe carrier for the nitro-glycerine, is itself combustible, and adds to the explosive effect, as it contains 100 per cent of actual explosive substance.

Carbo-dynamite, moreover, is not hygroscopic, water apparently having no action upon it. We have examined some of this compound, says *Iron*, which had been immersed in water for more than six weeks, but which had not undergone the slightest change, nor was there any exudation. Some ordinary dynamite, placed in water at the same time as the carbo-dynamite, had become dissolved, and the nitro-glycerine was lying at the bottom of the water. This freedom from exudation opens up another important application, namely, that of its use in fiery mines. It is found that it can actually be mixed with water, and thus a double advantage is said to be brought about. In the first place its power is toned down so that it is rendered available for use in coal getting, where a soft explosion is required; and in the second it is rendered safe against communicating explosion to the gases common to most coal measures. This latter result arises from the circumstance that the volume of steam generated at the moment of explosion extinguishes any flame that may be produced. Beyond this, however, the steam is said to add to the effect of the shot, which points to the employment of a somewhat reduced charge.

The Proposed Railway from St. Petersburg to Pekin and the Pacific.

The proposed Siberian railway is to extend from St. Petersburg to Vladivostock on the Pacific Ocean, which is located nearly opposite San Francisco, and distant therefrom about 4,000 miles. Branch lines of the proposed road would extend to Pekin. The new road would be about 4,500 miles in length.



SUMMIT OF MT. HOOD.

General Annenkoff, who acquired so much renown for the vigorous and successful manner in which he built the great transcaspian railway, is strongly in favor of this Siberian project, and is reported as saying that when constructed, railway communication between London and Pekin can be had in 18 days, whereas now it takes 35 from London *via* Canadian Pacific and 48 days *via* Suez.

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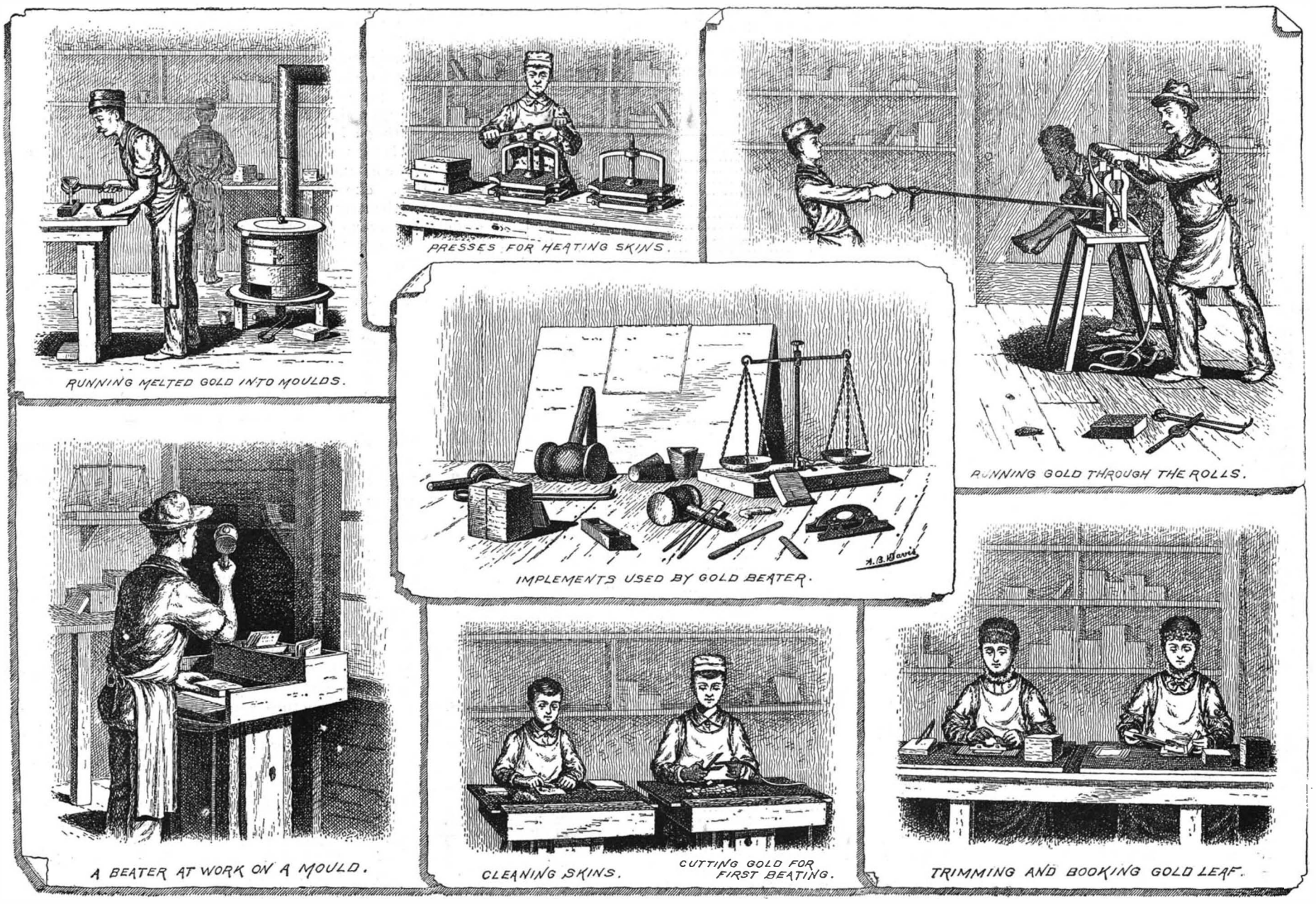
GOLD BEATING.

The rough gold is put into a stone crucible, melted, and poured into a mould which gives it the right width for rolling. One hundred dollars' worth of gold is generally moulded at a time, the weight being about 5 ounces. It is then run through the rollers, the pressure of which is so great that the little bar of gold that is 1 inch in width and about 3 inches in length, after being run through several times, becomes a strip about 14 yards in length and about the thickness of a hair. The strip is then cut into 1 inch squares. These squares are put into what is called a cutch. This cutch is composed of 180 skins 3½ inches square. The material that these skins are made of is an invention of French origin, and is kept secret. Formerly vellum was used. A gold square is placed between each skin, one directly over the other, until the cutch is filled. Two parchment bands are put over them in opposite directions to keep them from shifting. The cutch is then beaten for 15 or 20 minutes with a 16 pound hammer. The gold is then taken out of the skins, quartered by a skewer, and put into what is called the shoder. The number of skins in a shoder is 680. These skins come from what is called the bung gut of an ox, one animal furnishing but two skins. The shoder skins are 4 inches square. They are put between the skins in the same manner as in the cutch. They are then beaten for 1½ hours with a 10 pound hammer, taken out, and again quartered with a piece of reed. They are then put into the mould one over the other, as before, until the 900 skins which the mould contains are filled. This is beaten with a hammer weighing 7 pounds for three or four hours. The leaf is then ready to be trimmed and booked. Before the beating process the skins are heated and primed to prevent the leaf from sticking. Heated presses are used to take the moisture from the skins. Each skin is rubbed with a hare's foot with plaster of Paris on both sides before beating. Each one of the first squares of gold beaten out makes 25 leaves, or one book. The trimming of the leaves before they are put into books is done by a sled-shaped machine called a wagon. The trimming and booking is done mostly by girls. The trimmings that are left from the leaves are scraped together and melted over. A little salt added makes it thoroughly clean. The granite block that the beating is done on is about 3 feet in height, the top surface being ground down perfectly smooth, so as to prevent the blows of the hammer from cutting the under side of the mould.


RUNNING MELTED GOLD INTO MOULDS.
PRESSES FOR HEATING SKINS.
RUNNING GOLD THROUGH THE ROLLS.
IMPLEMENTS USED BY GOLD BEATER.
A BEATER AT WORK ON A MOULD.
CLEANING SKINS.
CUTTING GOLD FOR FIRST BEATING.
TRIMMING AND BOOKING GOLD LEAF.

GOLD BEATING.

Ancient Rome.

After carefully examining all the data we have, all the statements of the various ancient writers who allude to it, and all the facts which seem to bear on the question, I am convinced that in estimating the number at 4,000,000 I am rather understating than overstating it. It is much more probable that it was larger than that it was smaller. De Quincy also estimates the inhabitants of Rome at 4,000,000. I will only cite one fact and then leave this question. The Circus Maximus was constructed to hold 250,000, or, according to Victor, at a later period probably, 385,000 spectators. Taking the smaller number, then, it would be 1 in 16 of all the inhabitants if there were 4,000,000. But as one-half the population was composed of slaves, who must be struck out of the spectators, when the circus was built there would be accommodation then for 1 in 8 of the total population excluding slaves. Reducing again the number one-half by striking out the women, there would be room for 1 in 4. Again, striking out the young children and the old men and the sick and impotent, you would have accommodation for nearly the whole population. Is it possible to believe that the Romans constructed a circus to hold the entire population of Rome capable of going to it?—for such must have been the case were there only 4,000,000 of inhabitants. But suppose there were only 1,000,000 inhabitants, it is plain from the mere figures that it would never have been possible to half fill the circus.—*Blackwood's Magazine.*

Test for Cement.

A new method of testing cement has been practiced by Herr Bohme, and is described in a German technical journal. Experiments were made with ten samples of cement, in order to ascertain, first, their general properties; secondly, their tensile and compression strength; and, thirdly, their power of resisting wear on the surface, or attrition. Some of the cement was mixed with normal sand, and during the 7 and 28 days that the briquettes were left to harden, some of them were exposed for part of the time to a temperature of —12° to —15° C. Tests were made of pure cement and of mixtures of 1 part by weight to 1, 2, 3, and 4 parts by weight of sand; all the specimen briquettes being exposed at first to moist air, then dried in air for 24 hours, then plunged into water, next air-dried again, and then frozen at a temperature of —12° to —15° C. They were afterward placed in water at 18° C. for four hours, frozen again for twenty hours, thawed once more for four hours, and left under water for the rest of their period of hardening. The surface attrition to which they were subjected was obtained by the use of a revolving iron plate supplied with a determined quantity of emery powder, loaded with a constant weight, and run for a given number of revolutions. The results are stated in very lengthy tables, and point to the general conclusions that the chief effect of exposure to frost is to retard the setting of the cement, causing it to remain soft, and reducing its tensile strength and resistance to compression. It is considered, however, that this retardation has little permanent effect; the cement becoming nearly equal to the unfrozen specimens after the lapse of a few days.

The Drug Trade Forty Years Ago.

Comparing the condition then and now, says a correspondent of the *Western Druggist*, one can scarcely realize the wonderful changes that have been wrought. Probably the most marvelous of all is that caused by the discoveries of German chemists, like the aniline dyes. I well remember when a farmer's wife would come into town to shop and would come into the drug store early in the morning to buy dyes. How we would take down a reference card and calculate how much of potass bichrom., logwood, sulphate of copper, how much of this and how much of that it would require to dye so many pounds of yarn. How much for red, how much for green, for maroon, etc. Many a time an entire morning would be required in waiting on such a customer, and the receipts three or four dollars. Although the dollars were great in those days, and the profits greater, it required hard and tedious work to take in what now can be done in a few minutes. Contrast the situation at present. A call for dyes, and one steps up to a nicely polished case; and having ascertained the kind desired, a neat little envelope is picked out with full directions for use.

It is not alone in the drug trade that such wonderful changes have been wrought in a lifetime, but the same advance has been made in every other class of trade.

A Prize Essay on Shoemaking.

Joliet, Ill., has a happy son of Saint Crispin in John Ryan, who recently won the international prize of $500 offered by a boot and shoe journal of Boston for the best essay on boot and shoe making in all its branches. Every State in the Union contested for the prize, together with Canada, New Brunswick, and Nova Scotia.

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Fruit Candying Industry of Leghorn.

Her Majesty's consul at Leghorn says that that city occupies the first place in Italy, and perhaps throughout the Mediterranean, for the preparation of the candied citron and orange peel so largely used in all branches of confectionery—citron being brought for this purpose from Corsica, from Sicily, from Calabria and other southern provinces of Italy, from Tunis and Tripoli, and even from Morocco; while the candied peel of the fruit is exported to North America, to the United Kingdom, and to Hamburg for distribution throughout Germany. Sugar also is imported for the purpose of the manufacture from Egypt. The wood of the boxes in which the candied peel is packed comes from Trieste, and the immense earthenware vessels necessary for the saturation of the fruit in sugar sirup are made in the neighborhood of Florence. The oranges imported into Leghorn, whether for consumption or for candying, are nearly all brought from the islands of Sicily, Sardinia, and Corsica. In all the countries contributing the raw fruit for this industry it is treated in the same manner for the over-sea passage. The fruit is simply halved and placed in hogsheads or large casks filled with a fairly strong solution of brine, the fruit being halved merely to insure thorough preservation of the rind by an equal saturation of the interior as well as the exterior surface. In these casks it arrives at the doors of the manufactory. The first process to which it is then subjected is the separation of the fruit from the rind. This is done by women, who, seated round a large vessel, take out the fruit, skillfully gouge out the inside with a few rapid motions of the forefinger and thumb, and throwing this aside, place the rind unbroken in a vessel alongside them. The rind is next carried to large casks filled with fresh cold water, in which it is immersed for between two and three days to rid it of the salt it has absorbed. When taken out of these casks, the rinds are boiled, with the double object of making them tender and of completely driving out any trace of salt that may still be left in them. For this purpose they are boiled in a large copper caldron, for a time varying from one to two hours, according to the quality of the fruit and the number of days it has been immersed in brine.

When removed from this caldron, the peel should be quite free from any flavor of salt, and at the same time be sufficiently soft to absorb the sugar readily from the sirup in which it is now ready to be immersed. The next process to which the rind is subjected is that of a slow absorption of sugar, and this occupies no less than eight days. The absorption of sugar by fresh fruit in order to be thorough must be slow, and not only slow but also gradual; that is to say, the fruit should be at first treated with a weak solution of sugar, which may then be gradually strengthened, for the power of absorption is one that grows by feeding. The fruit has now passed into the saturating room, where on every side are to be seen long rows of immense earthenware vessels, about 4 feet high and 2½ feet in extreme diameter, in outline roughly resembling the famed Etruscan jar, but with a girth altogether out of proportion to their height, and with very short necks and large open mouths. All the vessels are filled to the brim with citron and orange peel in every stage of absorption—that is to say, steeped in sugar sirup of about eight different degrees of strength. This process almost always occupies eight days, the sirup in each jar being changed every day, and with vessels of such great size and weight, holding at least half a ton of fruit and sirup, it is clearly easier to deal with the sirup than with the fruit. To take the fruit out of one solution and to place it into the next stronger, and so on throughout the series, would be a very tedious process, and one, moreover, injurious to the fruit. In each of these jars, therefore, there is fixed a wooden well, into which, a simple hand suction pump being introduced, the sirup is pumped from each jar daily into the adjoining one. A slight fermentation next takes place in most of the jars, but this, so far from being harmful, is regarded as necessary, but is not allowed to go too far. There is yet another stage, and that perhaps the most important, through which the peel has to pass before it can be pronounced sufficiently saturated with sugar. It is now boiled in a still stronger sirup of a density of forty degrees by the testing tube, and this is done in large copper vessels over a slow coke fire, care being taken to prevent the peel adhering to the side of the vessel by gently stirring with a long paddle-shaped ladle. This second boiling occupies about an hour. Taken off the fire, the vessels are carried to a large wooden trough, over which is a coarse open-wire netting. The contents are poured over this and the peel distributed over the surface of the netting, so that the sirup—now thickened to the consistency of treacle—may drain off the surface of the peel into the trough below. The peel has now taken up as much sugar as is necessary. Next comes the final process, the true candying, or covering the surface of the peel with the layer of sugar crystals which is seen on all candied fruits. To effect this a quantity of crystallized sugar—at Leghorn the same quality of sugar is used as is employed in the preparation of the sirup—is dissolved in a little water, and in this the now dried peel, taken off the wire netting, is immersed. The same copper vessels are used, and the mixture is again boiled over a slow fire. A short boiling will suffice for this the last process, for the little water will quickly be driven off, and the sugar upon cooling will form its natural crystals over the surface of the fruit. Poured off from these vessels it is again dried upon the surface of the wire netting as before described. The candying is now complete, and the candied peel is ready for the packing room, to which it is carried in shallow baskets. In the packing room may be seen hundreds of boxes, of oval shape and of different sizes, for each country prefers its boxes to be of a particular weight, Hamburg taking the largest, of 15 and 30 kilogrammes, the United States of America preferring smaller, of 10 and 12 kilos., while England takes the smallest, of 5 kilos., and one containing about 7 English pounds.

Gold and Silver for 1888.

The annual report of Dr. J. P. Kimball, director of the mint, on the production of gold and silver in the United States for the calendar year 1888 has just been issued. The official figures of the mint bureau since 1880 are as follows:

PRODUCTION OF GOLD AND SILVER (COINING VALUES) IN THE UNITED STATES—1880-1888 INCLUSIVE.

Year.	Gold.	Silver.	Total.
1880	$36,000,000	$39,200,000	$75,200,000
1881	34,700,000	43,000,000	77,700,000
1882	32,500,000	46,800,000	79,300,000
1883	30,000,000	46,200,000	76,200,000
1884	30,800,000	48,800,000	79,600,000
1885	31,800,000	51,600,000	83,400,000
1886	35,000,000	51,000,000	86,000,000
1887	33,000,000	53,357,000	86,357,000
1888	33,175,000	59,195,000	92,370,000

PRODUCTION OF GOLD AND SILVER (COINING VALUES) IN THE UNITED STATES IN 1888, BY STATES AND TERRITORIES.

State or Territory.	Gold.	Silver.	Total.
Alaska	$850,000	$3,000	$853,000
Arizona	871,500	3,000,000	3,871,500
California	12,750,000	1,400,000	14,150,000
Colorado	3,758,000	19,000,000	22,758,000
Dakota	2,600,000	100,000	2,700,000
Georgia	104,000	500	104,500
Idaho	2,400,000	3,000,000	5,400,000
Michigan	42,000	84,000	126,000
Montana	4,200,000	17,000,000	21,200,000
Nevada	3,525,000	7,000,000	10,525,000
New Mexico	602,000	1,200,000	1,802,000
North Carolina	136,000	3,500	139,500
Oregon	825,000	15,000	840,000
South Carolina	39,000	200	39,200
Utah	290,000	7,000,000	7,290,000
Washington	145,000	100,000	245,000
Texas	.. .	300,000	300,000
Alabama, Maryland, Tennessee, Virginia, Vermont, and Wyoming	30,000	500	35,000
Total	$33,167,500	$59,206,700	$92,374,200

WORLD'S PRODUCTION OF GOLD AND SILVER (U. S. COINING VALUES)—1884-1887 INCLUSIVE.

Years.	Gold.	Silver.	Total.
1884	$99,432,795	$95,832,084	$195,264,879
1885	95,757,582	126,764,574	222,522,156
1886	94,642,070	124,854,101	219,496,171
1887	124,992,455	163,411,397	288,403,862

THE WORLD'S PRODUCTION OF GOLD AND SILVER (U. S. COINING VALUES) BY COUNTRIES, IN 1887.

Countries.	Gold.	Silver.	Total.
United States	$33,000,000	$53,357,000	$87,357,000
Australasia	27,327,600	266,900	27,594,500
Mexico	824,000	37,570,000	38,394,000
Russia	20,092,000	562,000	20,654,000
Germany	1,496,000	994,500	2,490,500
Austria-Hungary	1,247,450	2,218,900	3,466,350
Sweden	55,550	242,250	297,800
Norway	....	299,000	299,000
Italy	129,600	1,406,350	1,535,950
Spain	....	2,258,000	2,258,000
Turkey	7,000	55,000	62,000
France	....	1,944,550	1,944,550
Great Britain	1,000	414,100	415,100
Canada	1,369,700	451,550	1,821,250
Argentine Republic	30,000	30,000	60,000
Colombia	3,000,000	1,000,000	4,000,000
Bolivia	72,000	10,000,000	10,072,000
Chili	1,591,400	8,537,350	10,128,750
Brazil	998,000	5,850	1,003,850
Venezuela	3,336,000	....	3,336,000
Peru	113,000	2,067,650	2,180,650
Costa Rica	87,000	....	87,000
Honduras	....	74,750	74,750
Salvador	66,400	240,000	306,400
Japan	375,000	1,332,650	1,707,650
Africa	1,919,600	17,960	1,937,560
China (Amoor district)	3,368,500	....	3,368,500
India (British)	320,000	....	320,000
Total	$100,826,800	$125,346,310	$226,173,110

The best builders keep on file the Architects and Builders Edition of the "Scientific American." It enables a person about to build to select from the engravings the style of house suiting his fancy and purse.

Mental and Musical Overstrain.

The weariness of long-continued study is proverbial. Its explanation is not far to seek. One portion of our entire being is almost exclusively occupied, and the monotony of the process constitutes in large measure the cause of exhaustion. Relief must accordingly be sought in rest, in the exercise of other functions, or in variation of the form of mental exertion. Such timely and refreshing change enters into all well-ordered plans of education. There is, however, in every study a stage at which persistent concentration is indispensable to anything like high development. Reiteration, though tedious, is necessary to full instruction. Perhaps no better illustration of this fact could be found than that which is constantly evident in the cultivation of music. One could hardly conceive of anything more truly monotonous than a continuance of that tax of patience, piano practice. No doubt inclination and inborn faculty may do much to create an interest, but the most enthusiastic learner will sometimes, notwithstanding, rebel against the exactions of musical cram. It has even been stated by a German observer that much of the nervous delicacy so common among girls is traceable to excessive diligence at the piano. There is more than a grain of truth in this observation. The limit of moderation, indeed, may not be capable of exact definition, for a longer or shorter period would naturally suit the need and capacity of different persons. One or two hours of practice, it is probable, would rarely prove excessive. When, however, six or eight hours are daily absorbed in repeating a humdrum series of manipulations, the wonder is that nature long endures the drudgery. Yet this is the common lot of many who aspire to skillful execution. The coveted perfection doubtless is often approximately reached, but the associated circumstance of nervous overstrain will suggest a doubt whether such qualified excellence is altogether desirable. At all events, it is but reason to allow that proficiency so dearly purchased is not, for young people of deficient nervous tone, a social necessity, especially if they be also void of any special artistic aptitude. Nay, even for those whose health and energy permit them to enjoy, if they choose, the privilege of musical hard labor, a frequent interlude of rest and recreation is no less needful than discreet.—*Lancet* (*London*).

The Corrosion of Iron in Structures and in Store.

In the course of his inaugural address as president of the Institution of Mechanical Engineers, Mr. Charles Cochrane drew attention to the deterioration of wrought iron when exposed to the influence of rain water, as being specially exhibited in bridges constructed on the Thames, the waste in which he regarded as aggravated by the acid condition of the atmosphere, due to the presence of sulphurous acid from the combustion of coal as well as to the customary percentage of carbonic acid. In the course of twenty-five years bolts have been eaten away from an original diameter of ⅝ inch to $\frac{5}{16}$ inch, being a reduction in area of 75 per cent, or from 0·81 to 0·08 square inch, and this in a portion of the structure where the brackets of an overhanging footpath were supported in part by the decaying bolts. Wherever the rain trickled over the face of the girders to which the brackets were attached, the same evidence of deterioration was manifested in the scaling of the plates, pointing both to the necessity of preventing water coming into contact with wrought iron and of periodically examining and painting structures of this material. Another illustration of insidious destruction of iron was named. This was the case of a wire rope at a colliery, kept in reserve to wind men up and down the shaft in case of ropes breaking or of other accident preventing the due use of the winding shaft. While at rest the emergency rope was subject to the drip of rain at the same spot for some years, from the roof of the engine house. External examination was strict, and the rope was regularly greased, as is customary. At length a man riding up the shaft was killed through the parting of the rope at the point exposed to the rain drip, and the wires internally were found to have been corroded the size of drawn-out needle points. Mr. Cochrane cited other instances of the decay of materials in store through small but continuously acting causes of corrosion.

A Great Organ.

The huge organ just completed by Messrs. Hill & Son, London, for the town hall, Sydney, has been exhibited to favored connoisseurs before its departure for its destination. At a recital given by Mr. W. S. Hoyte the resources of its five manuals and 126 speaking stops were shown. The most remarkable feature of the instrument, however, is its 64ft. stop, a striking reed of true length on the pedal organ. The lowest note of this stop, expressed in organ builders' language as "CCCCC," is two octaves below the lowest C on the pianoforte, and as it gives only eight vibrations in a second, it cannot be perceived as a note at all. Its effect lies wholly in the extraordinary richness and power of its upper harmonics, by which it re-enforces notes given by the higher pipes.

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Compressed Bran.

At the recent meeting of the Millers' National Association, Milwaukee, Mr. W. De la Barre described the Nagel & Kaemp machine for bran compression.

The invention consists in a mode of forming dry cake from the husks, shells, or cortex of the cereals, or from bruised or broken grain itself, especially from bran, which consists in dissolving the glutinous substances contained in the material named, especially, though, the gum, only on the surface of separate particles thereof, by means of hot steam, so that the body of the particles of the bran or other material shall remain dry, and then pressing the mass hot, whereby a coherent and dry cake will be formed.

The salient feature of the invention resides in the use of steam at such high temperature that, without wetting their interior, the agglutination of the particles of the mass may be secured to cause them to cohere into a firm and dry cake upon pressure.

The steam dissolves the glutinous matters on the surface of the separate particles at once and in sufficient quantity, so that upon the application of pressure a firm cohesion of all the parts is effected and the production of a solid dry cake achieved. The quantity of steam to be introduced into the apparatus is governed by the kind and quantity of material to be treated. As the bran passes to the press in a heated condition, the contained or inherent heat causes the cake to come from the press in an absolutely dry state, so that the same, even when stored in a place not perfectly dry, will not spoil.

There is no subsequent falling apart or crumbling of the cakes, since the material becomes unitary—in all parts a firmly cohering mass. Hence any breaking off or injury to the corners of a cake has no deleterious effect upon the holding together, firmness, or cohesion of the same. It is clear that to attain this result it is essential that the bran should be pressed while dry and hot, and that therefore the admission of steam must be so regulated that nothing like a pulpy mass will be formed. In such case, upon pressing, the crust which would be formed upon the surface of the cake would prevent a thorough drying, so that moisture would remain in the interior, which would be productive of speedy spoiling.

By the same procedure coarse unbolted flour or meal or broken grain may likewise be converted into firm and solid cakes.

Bran and similar materials possess within themselves the necessary properties for securing the required adhesion of the various particles when acted upon by warmth and moisture in a suitable manner, and it is upon this fact that the Finke-Lesshafft process has its foundation.

The formation of cakes by pressing bran is not new. This has even been done with a warming and steaming of the bran; but it is new in the procedure that directly before pressing the bran or the like is steamed, and to that point that the glutinous matter therein contained, especially the gum, is so far dissolved that the separate particles of the bran upon pressing into cake will firmly stick together without leaving the cake moist.

Messrs. Nagel & Kaemp, of Hamburg, have devised a machine of ingenious construction, which embodies the Finke-Lesshafft process, and which produces a constant stream of compact and durable bran cakes in a simple and expeditious manner.

The compressing apparatus as devised and patented by Messrs. Nagel & Kaemp resembles somewhat an iron planing machine in its outward appearance.

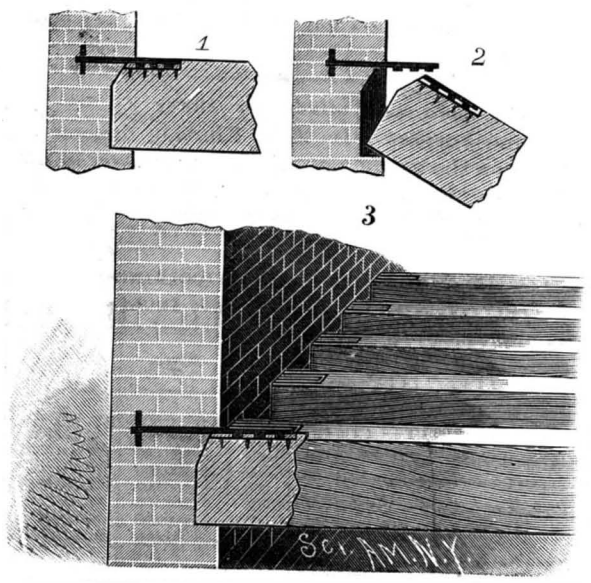
There is a solid iron frame with a crankshaft which sets in motion two or more plungers, which work into pressing cylinders arranged horizontally on this frame, and each time the plungers are drawn toward the crank a measured quantity of bran falls into these pressing cylinders. Upon the advance of the stamp this material is forced into a long and suitably formed mould, and from this the finished cakes are discharged somewhat after the manner of bricks in a brick press.

The crank works within a link to which the stamps or plungers are attached, and the whole is driven by a belt, pulley, and geared wheels. The material to be pressed enters first into a separating chamber, and is thence discharged into the heating and steaming apparatus below. This apparatus is furnished with a steam jacket and contains a series of plates placed one over the other in such a manner that the material falling upon them is minutely subdivided, and in this condition is subjected to the heating and steaming process already referred to before passing into the pressing cylinder.

The capacity of this bran press is equal to about 1,500 to 2,000 pounds weight of bran per hour. The machine requires for its operation from 5 to 7 horse power and one man as attendant. Cakes formed by this process weigh upon the average one ton per cubic meter (35 cubic feet), and form a feeding material much better adapted to storage or transport than bran packed in the usual manner. The cakes are eaten by horses in a dry state, while for other animals they are broken up. Tests have demonstrated the fact that cakes are quite as nutritious as loose bran, while the advantage in the matter of storage and transport will be self-evident.

AN IMPROVED FLOOR BEAM CONNECTION.

The accompanying illustration represents an anchor for beams in buildings of such construction that the beam will free itself from the wall in case the beam is burned through or breaks centrally, permitting the falling of the beam without injury to the wall. The invention has been patented by Mr. Thomas Edwards, Sr., of Chicago, Ill. Figs. 1 and 3 show the wall with the beam anchored in position, Fig. 2 representing the beam falling from the wall. The anchor bar has a cross plate embedded in the wall, and on its inwardly extended end are downward projections. In the upper edge of the end of the floor beam is secured a plate in which is formed recesses adapted to receive the anchor projections. With such construction the beams, on breaking, drop from the anchor, leaving the walls



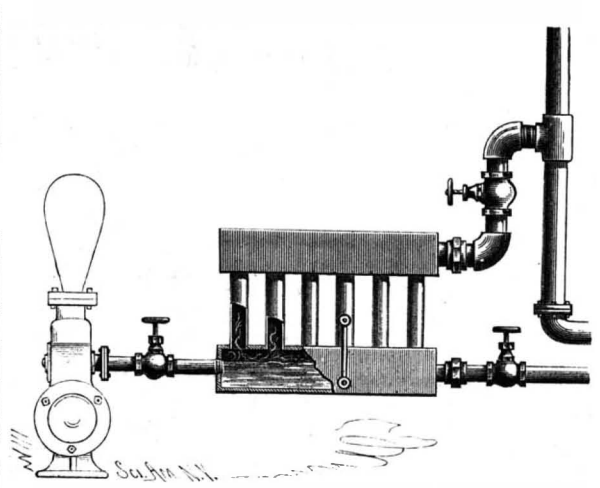
EDWARDS' FLOOR BEAM CONNECTION.

intact and in condition to receive new sets of floor beams should it be desired in rebuilding.

For further particulars with reference to this invention address Judge Boorum, No. 317 Church Court, Chicago, Ill.

AN IMPROVED FEED WATER HEATER AND CONDENSER.

The accompanying illustration represents a device for utilizing the exhaust steam of the engine for heating the feed water, which has been patented by Mr. John Willenbrink, of New Richmond, Ohio. The water supply pipe is connected at one end with the source of supply, and at its other end with a pump, valves being near either end, and between these valves a number of pipes extend upward from the supply pipe to a horizontal pipe, closed at one end, and connected at its other end by a branch pipe with the exhaust from the engine. On this branch pipe is a valve to regulate the amount of exhaust steam admitted, and on the supply pipe and one of the vertical pipes is held a gauge to indicate the amount of water in the pipes. With this construction the water passing through the supply pipe comes in contact with and is heated by the exhaust steam in the vertical pipes, and part of the steam also mingles with the water to be carried back



WILLENBRINK'S FEED WATER HEATER AND CONDENSER.

to the boiler, while, when the valves are closed in the supply pipe, the water remaining therein is heated by the exhaust steam in the vertical pipes.

A Shipload of School Teachers.

The steamer Suevia recently carried away more than 400 school teachers and their friends from this port. Many of them were Ohio teachers, and more than half of the number were women who had been laying aside money for a year to spend it in a pleasure trip abroad. The excursion was organized by the Cincinnati Teachers' Association, and the Suevia was chartered for the trip. This is the eighth season in which a teachers' excursion has been sent out.

Immense Spiders.

Far up in the mountains of Ceylon and India there is a spider that spins a web like bright, yellowish silk, the central net of which is five feet in diameter, while the supporting lines, or guys, as they are called, measure sometimes ten or twelve feet; and riding quickly in the early morning you may dash right into it, the stout threads twining around your face like a lace veil, while, as the creature who has woven it takes up his position in the middle, he generally catches you right on the nose, and, though he seldom bites or stings, the contact of his large body and long legs is anything but pleasant. If you forget yourself and try to catch him, bite he will, and though not venomous, his jaws are as powerful as a bird's beak, and you are not likely to forget the encounter.

The bodies of these spiders are very handsomely decorated, being bright gold or scarlet underneath, while the upper part is covered with the most delicate slate-colored fur. So strong are the webs, that birds the size of larks are frequently caught therein, and even the small but powerful scaly lizard falls a victim. A writer in *Rare Bits* says that he has often sat and watched the yellow monster—measuring, when waiting for his prey with his legs stretched out, fully six inches—striding across the middle of the net, and noted the rapid manner in which he winds his stout threads around the unfortunate captive. He usually throws the coils about the head till the wretched victim is first blinded and then choked. In many unfrequented dark nooks of the jungle you come across most perfect skeletons of small birds caught in these terrible snares, the strong folds of which prevent the delicate bones from falling to the ground after the wind and weather have dispersed the flesh and feathers.

Production of Iridescent Horn Buttons.

According to the *Journal for Export and Import*, 10 pts. pure methyl violet are dissolved in 80 pts. alcohol 95 per cent, the solution filtered, 4 pts. sandarac added and frequently shaken to promote the solution of the latter. The sandarac being dissolved, ½ pt. Venetian turpentine is in a suitable vessel liquefied over fire, and the liquid, at some distance from the fire, under stirring, poured into the sandarac solution; then the mass is allowed to stand for several days in order to give the impurities contained in the sandarac time to settle. The buttons, sewed upon cards, are now, by means of a soft hair brush, carefully varnished over, taking care that the cards are not soiled. The buttons show now a brown, coppery metallic luster, which can by various chemicals be converted into iris colors. When the buttons are painted over, by means of a soft hair brush, with dilute hydrochloric acid, a surface is obtained which glistens in all colors of the rainbow; the same effect is obtained by simply moistening the buttons with saliva. A light and iridescent color is produced with vinegar; if the latter is repeatedly applied, the coloring approaches that obtained with hydrochloric acid. To give the buttons a deep, dark green iridescent coloring, they are very lightly wiped over with a rag moistened with oil, and at once rubbed off with a dry woolen rag. Similar effects are obtained with bluestone and copperas, bichromate of potash, kitchen salt, borax, and many other salts dissolved in water. With permanganate of potash, all colors, from light red through dark red, violet, blue, and green, can be obtained. The more diluted the solution is, and the shorter the time of its action, the lighter are the colors thereby produced. With the solution of 1 pt. permanganate of potash in 16 pts. distilled water a green iridescent coloring is obtained; this solution diluted with 8 pts. water gives a blue iridescence; this again diluted with 8 pts. water gives violet; a farther dilution dark red, and another addition of water produces a light red iridescent coloring. (Romen's.)—*Textile Colorist.*

A Great Steamer.

On June 29, the White Star royal mail steamer Majestic, twin ship to the Teutonic, launched in the beginning of the year, was launched from Messrs. Harland & Wolff's yard at Belfast. As the Teutonic and the Majestic are the largest merchant vessels afloat, the following particulars may be interesting: The length of the ships is 582 feet, breadth 57 feet 6 inches, depth 39 feet 4 inches, with a gross tonnage of nearly 10,000. They are built of Siemens-Martin steel, and are propelled by two independent sets of triple expansion engines, constructed by Messrs. Harland & Wolff, driving twin propellers with manganese bronze blades. In form and construction of hull they possess all the distinctive beauty of outline and strength which characterized their predecessors the Oceanic, Adriatic, Britannic, Germanic, etc., with the addition that, while they are as minutely subdivided by athwartship bulkheads, they are also made with a longitudinal bulkhead running fore and aft throughout the greater portion of their length, giving additional rigidity and strength to their structure, and greatly increasing the security of the ships in the event of collision. The ships ply between New York and Liverpool.

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RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM BOILER.—Daniel T. Lawson, Wellsville, Ohio. This boiler has a horizontal diaphragm separating the steam space from the water space, with upwardly opening check valves and gathering troughs for sediment, blow-out pipes extending through the boiler from the level of the troughs, the invention being an improvement on a former invention of the same inventor designed to render the boiler automatic in its action.

Railway Appliances.

TRAIN INDICATOR.—Jabez T. Odell, Richmond, Va., and Thomas J. De Lamere, St. Paul, Minn. This invention covers a system for the use of the master of transportation, in which a large board is used, in connection with a map of the road, and the movements of the trains and their character are indicated by movable boxes, attached by pegs, whereby an accurate and complete account may be kept of all trains moving on the road, and their location, number of cars, etc., determined at a glance.

BRAKE.—Frederick W. Reiss, Philadelphia, Pa. Eccentrics or cranks are mounted on the axles, sliding bars connecting the eccentrics, and a clamp binding the bars together with greater or less pressure, the clamp being operated by brake rods worked by the usual brake wheel, lever, or other controlling devices, the invention being also applicable for controlling rotary motion generally.

CANCELING AND REGISTERING DEVICE.—Arthur J. Miller, Sweden, Pa. This is a device specially intended for conductor's use in canceling and registering tickets, at the same time ringing a bell at each cancellation, the device being simple and durable in construction and very effective in operation.

SLEEPING CAR.—Charles L. Arnold, Wilmington, N. C. This invention covers novel combinations and arrangements of parts in a car designed to be readily converted from an ordinary passenger car into a sleeping car, and by means of which the greatest amount of room may be obtained and the utmost privacy secured.

Mechanical.

MECHANISM FOR CONVERTING MOTION.—Thomas C. Thomas, Salt Lake City, Utah Ter. This invention consists of a centrally pivoted oscillating toothed contrivance or plate having engagement with cogged or toothed segments or disks applied to a driving shaft, with means for reversing the rotary motion shaft, for the ready conversion of reciprocating into rotary motion, and also to effect the reversal of the resultant motion.

MACHINE FOR LINKING WARPS.—Clayton Denn, Philadelphia, Pa. This is an improvement designed to simplify machines employed for forming "chained" or "linked" warps immediately upon the yarn being delivered from the warp machine, whereby the work will be done more rapidly and regularly, and the yarn will be double linked or chained and subjected to only a minimum strain.

METAL FORMING MACHINE.—Michael T. Durkin, Brooklyn, N. Y. This is a machine for forming sheet metal in the manufacture of cornices, mouldings, balusters, etc., the invention consisting mainly in an arrangement of the die holders by which the dies may be inclined at any desired angle and clamped firmly in the position of use, the die holders holding the dies without any special fitting of the latter to the holders, while the dies may be adjusted without changing the position of the holders.

ROPE MAKING MACHINE.—Michael Furst, Brooklyn, N. Y. This invention covers an improved flier of simple and durable construction designed to hold the bobbin safely in place while the flier frame is rotated, while the bobbin may be quickly removed and placed on the carriage when desired.

Agricultural.

THRASHING MACHINES.—John D. Burkhart, Dayton, Washington Ter. This is a device adapted to be readily attached to any harvester in a few minutes to level and steady the separator, the device being simple and strong in construction, and costing but little to manufacture.

CORN SHELLER.—Asahel H. Patch, Clarksville, Tenn. This invention covers an improvement on a formerly patented corn sheller of the same inventor, a semicircular guard being formed integral with the chute, and making a perfect guide for the cob as it passes out, while the size of the hopper is adjustable to receive larger cobs than the general average.

COTTON CHOPPER.—William P. Clark, Elberton, Ga. This is an improvement on a former patented invention of the same inventor, providing for the adjustment of the knives or cutters, and to so construct and arrange the parts that the cutter shaft may be driven positively by gearing, or by frictional contact with the driving wheel.

Miscellaneous.

SNOW PLOW.—William H. Deadman, Alpena, Mich. This is a plow for forming roads, and has two plow sections with the forward ends of their beams adjustable, with draught connections between the plow sections and the truck, the two plows being of novel construction and arranged side by side, with the landside of one facing that of the other, and the plows having adjustable hinged wings arranged one above the other.

HANDLING COKE.—Joseph Watts, McKee's Rocks, Pa. This invention provides means for loading coke from the oven directly to the car or vehicle whereby it is to be removed, at small expense of labor and free from dirt or ashes, a crane being mounted to travel on a carriage, and a fork having a sliding and flexible connection with the crane by means of a wheeled frame traveling thereon.

LAND ROLLER.—John M. Fellows, Burlington, Ind. This roller has a main frame mounted on wheels and having pivoted arms, each universally connected with a frame carrying a land roller, the arrangement being such that the several rollers can drop one behind the other, so as to take up but little room in moving the land roller from place to place.

GRAIN SEPARATOR.—Archibald M. Mecklem, Colfax, Washington Ter. This invention covers a novel construction and combination of parts in a machine in which the several screens are connected with shoes which are swung backward and forward with sudden jerks, the motion being particularly advantageous for cleaning the sieves, while the screenings and grain are thoroughly separated.

COUNTER FOR TRANSFERRING MONEY.—James S. Key, New York City. This is a device adapted to be placed in the usual opening in a cashier's desk to facilitate the making of change, by delivering the change directly in the hand of the party in front, obviating the necessity of picking up small coin or tickets from a smooth surface.

WRAPPING MACHINE.—David F. McDonald, Lake Butter, Fla. This is a machine for wrapping oranges and other fruit for shipment or storage, a carrier moving the wrapping paper forward to where the oranges are fed, a clamp pressing the edges of the paper in neck-like form around the orange, while the orange holder and clamp are rotated to twist the wrapper around the orange, the discharger then forcing the orange out of the machine.

PEN HOLDER.—James P. Egan, New York City. This holder has a rigid handle and a flexible pen receiver, means being provided whereby the degree of flexibility may be regulated at will, the device rendering the pen capable of an elastic movement on the paper to be written upon.

POSTAGE STAMP HOLDER.—David M. Block, New York City. This is a device in tubular form, to be carried in the pocket, and also containing a pencil and eraser, the postage stamps being rolled upon a pin or spindle in the tube and thus protected from dust and moisture.

INHALER MASK.—Ernest H. Hilchen, Jersey City, N. J. This mask has an outer plate with a transparent panel, a rear plate apertured to receive the face of the wearer, and a yielding cushion arranged about the edge of the aperture, providing a means by which the wearer may enter apartments filled with noxious vapors, or firemen may enter dense volumes of smoke without injury.

LINIMENT.—James S. Schrack, Jesup, Iowa. This is a composition of matter to be used for curing and healing flesh wounds, such as cuts from barbed wire fences, etc., consisting of spirits of turpentine, olive oil, sulphuric acid, carbolic acid, strained honey, etc., combined after a specified manner in certain proportions.

ABDOMINAL SUPPORTER.—Ida M. Ferris, Osage City, Kansas. Combined with a breast bandage is an abdominal and back pad, straps connecting the pads, and keeper straps connecting the bandage and pads, while a belt engages the keepers of the straps, the device being especially designed for the use of women after confinement.

WALKING STILT.—George R. Nafis, Brooklyn, N. Y. This is a stilt in which the step bracket can be easily and quickly adjusted to any desired height on the pole, a sleeve sliding on the pole and being parted lengthwise of it, a bolt being held in the sleeve, while the bracket is held in the parted ends of the sleeve and has an inclined slot through which the bolt passes.

IRONING BOARD.—Phillip Hires, Clinton, Ky. This board is of tapering width and has at its widest end a longitudinal slot open in the rear for the insertion of an independent foot or brace having a series of steps, either one of which may be used to support the board upon the end of a table, shelf, or other fixture.

CARPET STRETCHER.—Thomas H. Maley, Andover, Dakota Ter. This is a device affording great facility of adjustment to suit different sized or shaped rooms, the stretching head of the device being adapted to stretch the carpet more in the direction in which the tacking down is progressing, while the whole may be conveniently operated by one person without standing on the portion of the carpet being stretched.

TREE PROTECTOR.—Herman F. Juette, Palmyra, Mo. This protector consists of a perforated sheet of tarred felt with its upper portion slitted to form a series of flaps, a wire passing through the flaps, which are adapted to overlap each other, the wire being bent at the time the flaps are overlapped to permit the protector to expand as the tree grows.

WHIP RACK.—Daniel T. Wilson and Frank C. Rheubottom, Union City, Mich. This is a portable rack of novel construction, designed to be placed in front of a place of business, to hold, without marring, crooking, or injuring them, a series of whips in rows, to expose them to view, while preventing the goods from being taken out without unlocking or opening the rack.

SIZING COMPOUND.—This is a sizing especially adapted for preparing an oiled surface, such as window shade cloths, to receive lithographic printing, and consists of copal varnish, beeswax, and certain numbers of thin and thick lithographic ink, mixed in certain proportions and boiled and applied as specified.

COAL BUCKET.—Gustavus L. Stuebner, Long Island City, N. Y. This bucket is composed of two sections having straight meeting edges, one section having a sloping front and sloping bottom, and having at its upper edge a band adapted to embrace the other section, the band having arms to which the other section is hinged, the sections being adapted to lock or open conveniently as desired.

PRINTER'S GALLEY.—George E. Lincoln, New York City. This is a galley open at one end and with one side pivoted by means of pivots located near the plane of the inner face of the side, and is designed to conveniently hold type without the aid of points, blocks, etc., and permit of easily and quickly removing all or any portion of the type.

NECKTIE FASTENER.—Amand Beauland, New York City. This fastener consists of an attaching plate having a keyhole slot, an open spring bent in peculiar form being secured to the plate, with upper and lower hooks, whereby a scarf may be quickly and conveniently suspended from the collar button and held in proper position on the shirt bosom.

HOG TRAP.—Solomon Loffer, Maitland, Mo. This invention covers a novel combination and arrangement of parts in a device for catching low animals, as hogs and sheep, the invention being an improvement on a former patented invention of the same inventor.

TOY.—Christian Wobito, New York City. This device consists of a body, preferably in the form of a bird, with wings hinged thereto, a spring for holding the wings normally closed, a return cord, and links connecting the spring and return cord to the wings, the toy to be operated on the principle of the return ball, and the wings opened in its flight.

SCIENTIFIC AMERICAN BUILDING EDITION.

AUGUST NUMBER.—(No. 46.)

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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
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Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1129) T. H. writes: I saw in a paper a while ago (I think it was yours) a discovery for making hydrogen, by a couple of German chemists. Could you give me the preparation through your paper? A. Zinc dust and slaked lime are mixed and heated in a retort, when the gas comes off in large quantities. See SCIENTIFIC AMERICAN, October 13, 1888, p. 231.

(1130) W. A. asks for (1) the best, cheapest, and most easy way to make ozone? A. The air surrounding an active static electrical machine becomes charged with ozone. A. Holtz or Wimshurst machine, if kept in operation, forms a good ozone generator. Also see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 512, 522, 657, and others. 2. The best, cheapest, and most easy way to make hydrogen? A. Hydrogen may be made by treating iron scraps or zinc with dilute sulphuric acid, or by passing steam over incandescent iron in a tube or retort. A recent method of making it consists in heating to redness zinc dust and slaked lime.

(1131) Inquirer writes: In your number for July 13, you spoke of using nitrate of ammonia for producing cold. How can I use it in an ordinary refrigerator in order to take the place of ice, of which we have none this year? A. Its use is hardly practical for your purposes. If dissolved in about double its own weight of water it lowers the temperature, and this may be utilized. But for an ordinary refrigerator too much would be required, and the recovery of the salt by evaporation would be troublesome.

(1132) H. W. B. writes: Can you give recipe for paste composition for positive and negative plates of accumulators? A. For storage batteries see SCIENTIFIC AMERICAN, July 13, 1889, page 22, and also consult the index of papers in SCIENTIFIC AMERICAN SUPPLEMENT. 2. Is there a way of hardening lead or lead composition, to make rigid bars, to strengthen the plates? A. Alloy it with antimony. 3. Coating for iron that will not peel off, to resist action of acids. A. Coat it with asphalt varnish or with enamel, or plate it with lead. 4. Difference between gas retort carbon and coke, which is best for battery, is the gas retort carbon a waste product to be had at the gas works? A. The carbon adheres to the sides and top of the retort and is much purer than coke, and more of the graphitic modification, it is far superior for batteries and can be procured at any coal gas works. It is a waste product. 5.

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Where to get mercury flasks, spoken of in SUPPLEMENT, for steam boiler. A. Apply to any dealer in physical and chemical apparatus. 6. Recipe for blood purifier for dogs. A. As an alterative use sublimed sulphur 5 parts, niter 1 part, linseed meal 1 part, lard or palm oil 2 parts. 7. Recipe for fixative for drawings. A. See answer to query No. 1040. Use dammar varnish or skimmed milk.

(1133) B. H. M. asks for the receipt for making bird lime, used to catch birds. A. Boil the middle bark of the holly 7 or 8 hours in water; place in a heap and cover until after some weeks it becomes mucilaginous. Rub it up in a mortar and wash and knead with rain water until of proper consistence. Put into preserve jars, and in four or five days it will be ready for use. Boil linseed oil until thick. The latter is of inferior quality.

(1134) J. McC. writes: I have an old ebony clarionet which I wish to polish. Please give a good recipe for a polish for the same. A. Dissolve beeswax in turpentine, and apply with hard rubbing, taking care not to use an excess.

(1135) C. A. asks: What chemicals would destroy carbonic acid gas the quickest, most easy, and cheapest way? A. Use freshly slaked lime as a powder, or mix with water, so as to make milk of lime, and use the liquid. Solution of caustic soda is, if anything, more efficient.

(1136) H. K. Z. asks: Regarding the uses of blood, aside from known use as a fertilizer, to what uses is it put, commercially, and in manufacturing? A. It is used to a large extent in the manufacture of sugar as a purifier and decolorizer.

(1137) W. A. R. asks (1) the process of making gum drop candies. A. A water bath or double pan is necessary. Introduce into the inner pan 9 pounds gum arabic, cleaned and sifted, with 6 pounds of sugar and 6 pints of water and heat. In about 6 hours it will form a thick mucilage. The models of the gum drops, little wooden buttons, are fastened in numbers to a board. A box is filled with powdered starch and the model board is forced down into it so as to form a series of depressions, or little cups. These are filled with the gum composition, which has been flavored to suit. After several days' standing the drops will be ready for crystallizing. To do this they are dipped in sirup and rolled in granulated sugar. 2. Is the ordinary glue of commerce poisonous to eat? A. No. 3. How can the taste and odor be removed? A. This is hardly practicable on the small scale. It is better to use gelatine. 4. Are cheap fruit jellies much adulterated with glues? A. Probably they are with gelatine. 5. Have you any book treating of this matter? A. We recommend the "Complete Practical Confectioner," which we can supply free by mail for $3.00.

(1138) T. L. C. asks: A recipe to prevent fleas from biting at night. I have tried coal oil without success. A. Try oil of pennyroyal. Otherwise clear out dogs and cats and kill the fleas. 2. As the moon makes its revolution in 29 days, 12 hours, 44 minutes, what does it lose in 24 hours, or in other words, if the moon rises at 10 A.M. to-day, what time will it rise to-morrow? A. The mean difference is 48¾ minutes. Eccentricities, anomaly, and latitude of place make much variation in its rising and setting. 4. Does the sun rise at the same time every four years? A. The sun rises at the same time on the corresponding date every four years.

(1139) W. N. asks a recipe for soldering bright steel wire that will hold and not rust. A. Mix 1 pound lactic acid, 1 pound glycerine and 8 pounds water so as to have a clear solution. This is non-corrosive, but does not work as quickly as the ordinary soldering acid.

(1040) D. Y. B. asks the time of year that meteors fall thickly, and the supposed cause. A. The meteorites may be expected from August 9 to 11 inclusive. Their radiant paint is in the constellation Perseus. See account of Meteoric Theories in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 172, 173, 311.

TO INVENTORS.

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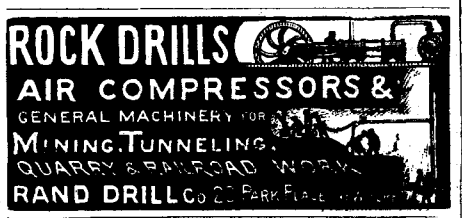

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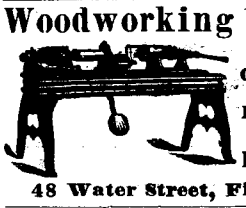

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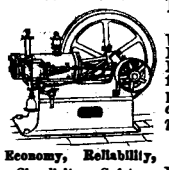

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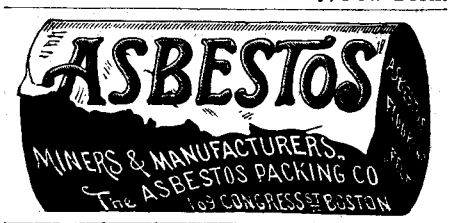

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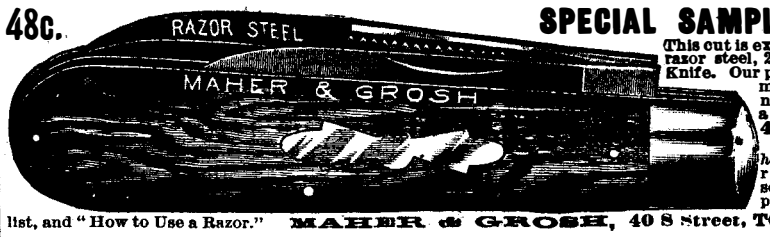
48c. 

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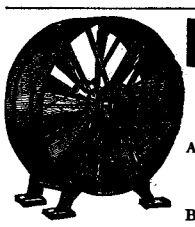

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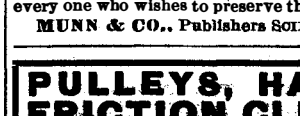

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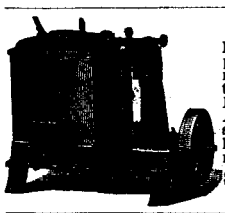

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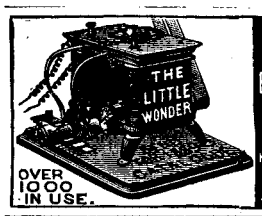

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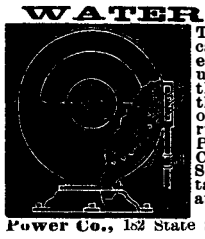
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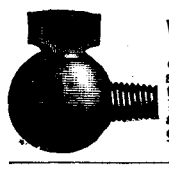

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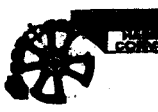

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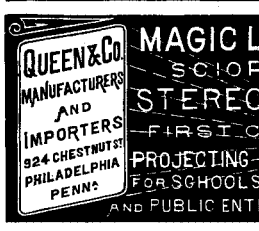

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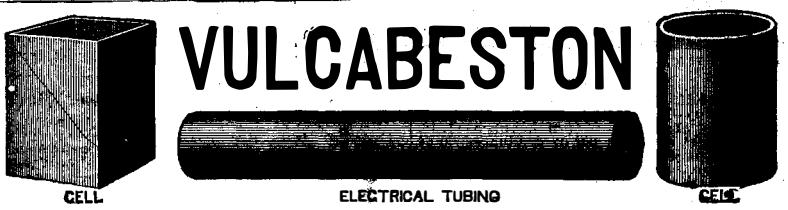

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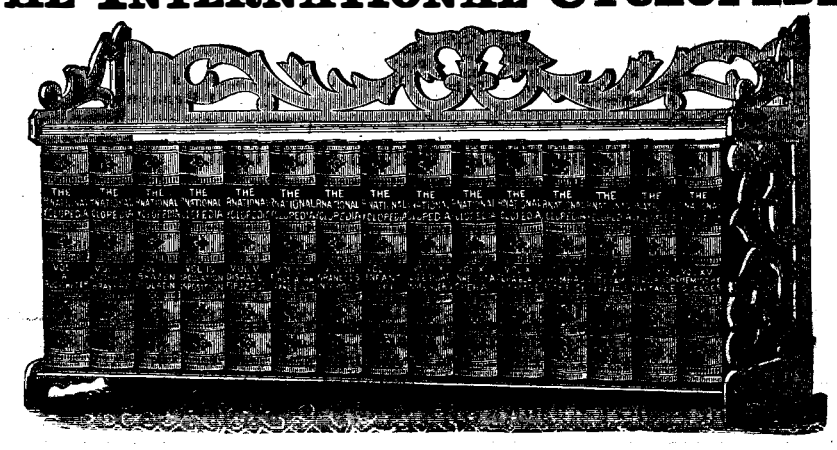

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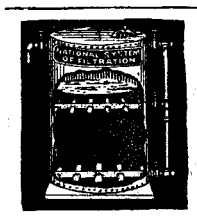

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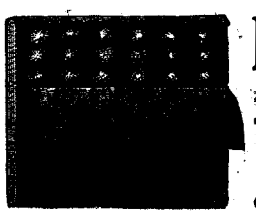

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